The UNESCO Courier

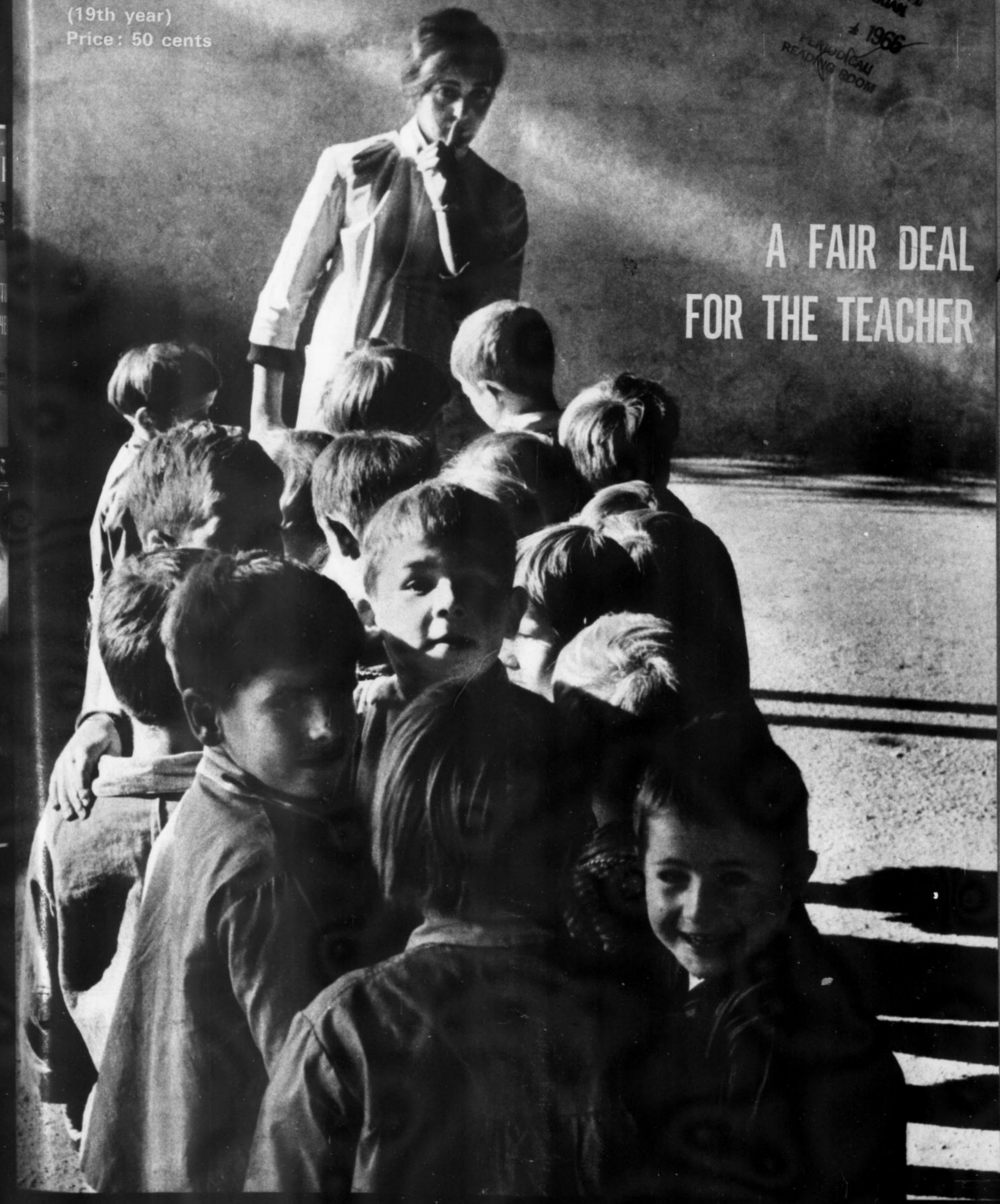
A window open on the world

September 1966
(19th year)
Price: 50 cents

O.P

UNIVERSITY OF MICHIGAN
1966
FERNWOOD CALI
READING ROOM

A FAIR DEAL FOR THE TEACHER



© Hugo Herdeg Erben, Zurich

TREASURES OF WORLD ART 8

Priestess of the springs

This robed priestess is one of several hundred tiny bronze statuettes, 3 to 12 inches high, discovered in the sanctuaries which the peoples of the nuraghi civilization in Sardinia built close to their island's fresh-water springs some 3,000 years ago. The ancient bronze figures from Sardinia are some of the liveliest expressions of late neolithic art among the Mediterranean peoples (see article page 16).

National Archaeological Museum, Cagliari, Sardinia

The UNESCO Courier

SEPTEMBER 1966 - 19TH YEAR

PUBLISHED IN NINE EDITIONS

English
French
Spanish
Russian
German
Arabic
U.S.A.
Japanese
Italian

Published monthly by UNESCO.

The United Nations Educational, Scientific and Cultural Organization

Sales & Distribution Offices
Unesco, Place de Fontenoy, Paris-7e

Annual subscription (any edition): $5.00; Single copies: 50 cents.

The UNESCO COURIER is published monthly, except in July and August when it is bi-monthly (11 issues a year) in English, French, Spanish, Russian, German, Arabic, Japanese and Italian. Sales and distribution : UNESCO Publications Center. U.S.A. 317 East 34th Street, New York, N.Y., 10016, MU 6-4707 (sole distributors of the U.S.A. edition). Second-class mail privileges authorized at New York, N. Y.

Individual articles and photographs not copyrighted may be reprinted providing the credit line reads "Reprinted from the UNESCO COURIER", plus date of issue, and three voucher copies are sent to the editor. Signed articles reprinted must bear author's name. Non-copyright photos will be supplied on request. Unsolicited manuscripts cannot be returned unless accompanied by an international reply coupon covering postage. Signed articles express the opinions of the authors and do not necessarily represent the opinions of UNESCO or those of the editors of the UNESCO COURIER.

The Unesco Courier is indexed monthly in the Readers' Guide to Periodical Literature.

★

Editorial Offices
Unesco, Place de Fontenoy, Paris 7e, France

Editor-in-Chief
Sandy Koffler

Assistant Editor-in-Chief
René Caloz

Assistant to the Editor-in-Chief
Lucio Attinelli

Managing Editors
English Edition: Ronald Fenton (Paris)
French Edition: Jane Albert Hesse (Paris)
Spanish Edition: Arturo Despouey (Paris)
Russian Edition: Victor Goliachkov (Paris)
German Edition: Hans Rieben (Berne)
Arabic Edition: Abdel Moneim El Sawi (Cairo)
Japanese Edition: Shin-Ichi Hasegawa (Tokyo)
Italian Edition: Maria Remiddi (Rome)

Illustrations: Betsy Bates

Research: Olga Rödel

Layout & Design: Robert Jacquemin

All correspondence should be addressed to the Editor-in-Chief in Paris.

Page

4 **A FAIR DEAL FOR THE TEACHER**
A proposed new code of the teacher's rights and duties
By Jean Thomas

7 **SEÑORITA LUCIANA**
Teacher in the High Andes

11 **UNGATHERED HARVESTS IN THE OCEAN**
Man's vast potential food reserve
By Mack Laing

16 **BRONZE MINIATURES FROM ANCIENT SARDINIA**
Masterpieces of a little-known Mediterranean art
By Antonio Borio

22 **THE YEARS OF THE QUIET SUN**
A striking example of global scientific co-operation
By Nicolai Pushkov and Boris Silkin

29 **U. N. DAY 1966 — THE WORLD'S REFUGEES**
By Yefim Zarjevski

32 **FROM THE UNESCO NEWSROOM**

34 **LETTERS TO THE EDITOR**

N° 8 - 1966 MC.66-1-216 A

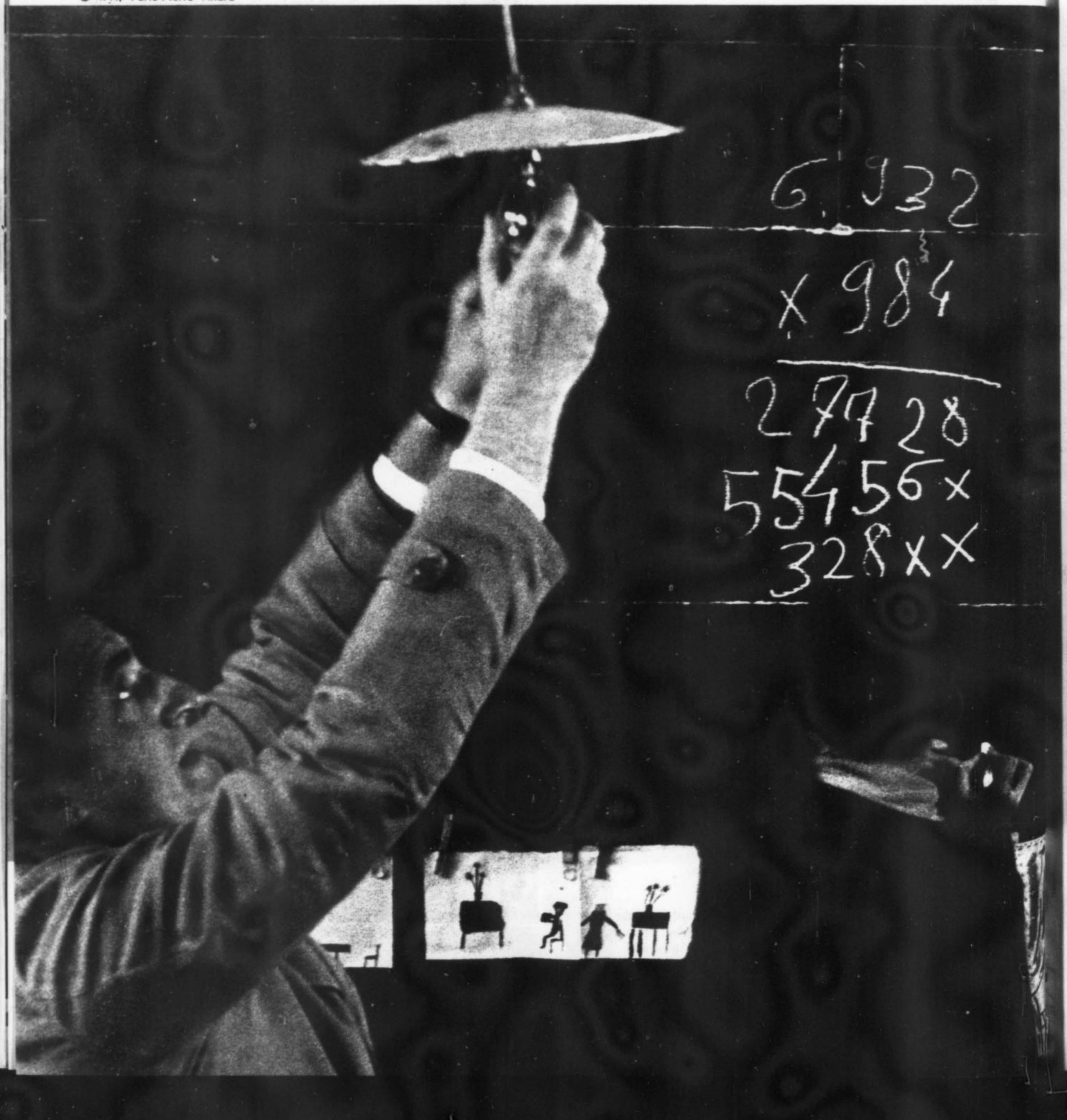
© IPN, Paris - Pierre Allard

Cover photo

The teacher has still to win a place in society worthy of his calling. Too often is he regarded as a kind of "poor relation" who, in the satisfaction of accomplishing a noble and useful mission, should find ample compensation for his modest means of subsistence. At a time when a world shortage of teachers and a vast increase in school populations are posing grave problems, Unesco has convened an intergovernmental conference to study recommendations designed to improve the professional, social and economic status of teachers (see page 4).

An international recommendation outlines a new code of rights and duties for the teaching profession

© IPN, Paris-Pierre Allard



A FAIR DEAL FOR THE TEACHER

by Jean Thomas

A special intergovernmental conference convened by Unesco is shortly to meet in Paris to consider and adopt an international recommendation on the status of teachers. The meeting will be the outcome of studies and consultations carried out jointly by Unesco and the International Labour Organization, with the help of many other international governmental and non-governmental organizations concerned with the progress of education. The aim is to give the highest official approval to a set of well-defined recommendations covering principles and standards whose application would give primary and secondary schoolteachers in every country a professional, social and economic standing worthy of their calling. Why have Unesco and the International Labour Organization decided to use such large-scale, complex machinery to help resolve the problems of one particular profession, and why has agreement between states become necessary in a field where national law and custom have always seemed adequate? The question is one which applies equally to many other situations that have arisen in the field of education.

FOR centuries, countries and communities did their best to provide young people with the right kind of education. And then, as education expanded and became increasingly complex, the whole fabric of the educational system began to crack and crumble apart.

Just when the rising generations were starting to crowd into the schools, the schools were unable to find room for them all. The need to build new schools and to find teachers to staff them became increasingly urgent. But where education once managed quite well with a few thousand primary or secondary teachers, it now needs to recruit tens and hundreds of thousands. And there is hardly a country in the world that is not facing this problem.

In matters of this kind people are easily impressed by figures. So much is heard about quantities: so many schools to be built and equipped, so many pupils to be taken in, so many teachers to be recruited, so much for capital investment, operating expenditure and staffing costs.

Yet quantity is the least important aspect of the problem. Even when countries are quite prepared to make all kinds of sacrifices to give their young people an education, what guarantee do they have that it will be a good education, in other words, that it will provide the intellectual and moral training which young people have the right to expect, and that it will produce the leaders which every nation needs? A country cannot afford to make mistakes in the education of its citizens any more than it can afford them in matters of defence, nutrition and health or in the exploitation of its natural resources and the use of its manpower.

Educational expansion is obviously a desirable thing, but if it is made at the expense of quality it soon becomes a harmful one. That is why educational planning, which has now become a universal need, must produce an accurate estimate of quantities, and a no less precise assessment of the level, type and methods of education that will be needed in the future.

Governments throughout the world are therefore anxious to reform education and to adapt existing structures, curricula and methods to modern needs. School systems based on time-honoured tradition are everywhere being transformed; new laws and regulations are being adopted and old ones rescinded; systems of selection and study guidance are being introduc-

CONTINUED ON NEXT PAGE

JEAN THOMAS *was Assistant Director-General of Unesco from 1956 to 1960. He was a member of the secretariat of the Unesco Preparatory Commission in 1946 and in 1948 became Director of Unesco's Department of Cultural Activities. He is now an inspector-general in the French Ministry of National Education.*

Drawn to careers with greater prestige

ed or modified; programmes are being streamlined or enriched with new subjects, and increasing use is made of fresh methods and teaching aids. Our century, at least in appearance, is the golden age of the science of teaching.

But ultimately the successful outcome of this tremendous effort is based on one factor: the competence and devotion of men and women whose profession it is to teach. Even when schools are superbly built, equipped with the finest libraries and apparatus and provided with well planned programmes, what sorts of results can be expected if the teachers are lacking in talent, poorly trained or dissatisfied with their conditions?

A good teacher can enhance the value of education; a bad one can jeopardize it. Whether one considers the benefit to the individual child or the collective interest of society, there is no escaping the fact that the quality of education always has been and always will be directly linked with the quality of the teacher.

Recruiting and training enough good teachers, giving them the work best suited to their aptitudes and tastes, providing the salary, working conditions and career prospects which will both enable and encourage them to devote themselves wholeheartedly to their work—these are not simply the answers to equitable demands; they are also the soundest way to meet a nation's needs. This is just as much a matter of good economic management as of equitable social organization. Thus, the obligation to give teachers their legitimate material and moral position in society ranks high among the factors that can improve education.

These facts are generally acknowledged, but only rarely is proper thought given to all their implications. The first of these, without a doubt, is that a great many well-qualified young people must be attracted to teaching careers. And it is here that the difficulties begin. The range of professions demanding top-level candidates with high intellectual and moral qualities is increasing, and so is the range of careers offering attractive prospects to the young.

Teachers are often told—especially when they are meeting together—that theirs is the noblest of all professions. This belief certainly does them honour, and there is no lack of arguments to uphold it. But what of priests, doctors, architects, engineers and farmers, for example? Is there not a nobility of purpose in consoling the afflicted, helping the sick, building new towns, designing machines capable of transforming standards of living, or in simply growing food for others to eat?

Even administrative careers, long considered as humdrum and lacking in opportunities for initiative and responsibility, are daily increasing in prestige because of their direct influence on every aspect of community life. A great variety of careers, all equally useful and noble, now offer attractive inducements to the intelligent young man or woman who is eager to serve.

Teaching cannot therefore claim, as in the past, to attract the very best minds; and indeed it would not be in society's interests if it did. The needs of education must take their place among many others; there can be no question of giving them an absolute priority.

However, these needs must not be sacrificed either, since this would create the most serious kind of imbalance in society. One of the essential preliminaries to a profession, however specialized, is a good general education; and it is the teacher's task to provide this education. Thus, of all public services, education is, if not the most important, at least the one whose need is most immediately obvious, and it is the duty of the state, and in its own interests, to see that the teaching profession receives its proper proportion of youthful talent.

This is the point on which public opinion, and especially the opinion of young people, needs convincing. It is no exaggeration to say that the public is generally ill-informed on the role of the teacher in modern society. At a time when so many other careers are taking on new lustre because they are seen to be closely linked with the wonders of science and technology, the teaching profession seems to be set in very old habits.

In a world of constant change, where newspaper articles and television programmes make engineers, research workers, doctors and surgeons appear as pioneers, the teacher has practically come to be considered as a survivor from a bygone age. Newspapers, books, theatre and cinema have all helped to build up a stereotyped image of the "typical" teacher: a man respected for his honesty, conscientiousness

CONTINUED ON PAGE 9

Inequalities in wages and working conditions

In many Latin American countries, between 70 and 75 per cent of primary schoolteachers are women. Teachers' salaries are generally very low—in some places less than those of unskilled workers. Generally speaking, a qualified teacher earns less than a skilled worker, and in certain countries a skilled worker is paid six times as much as a teacher. In one capital city, for example, a qualified teacher earns as much as a building foreman; yet in the rural areas of the same country a teacher receives hardly more than three-fifths the salary of a building foreman. Since 60 to 70 per cent of Latin America's people live in the countryside, the proportion of rural primary teachers in the continent is extremely high.

In Africa, non-qualified teachers make up from ten to 30 per cent of teaching staffs in some countries; in others they represent anything from 40 to 75 per cent. The majority of African teachers work under poor conditions, often having to make do with dilapidated buildings or uncomfortable tents. Many schools are built far from the main centres of population and are often so isolated that teachers have difficulty not only in receiving school equipment, as well as their salaries, but also in procuring food and water. Many teachers, especially those in rural areas, are leaving the profession, which is classed among the lower echelons of public service.

In Asia, teachers are less favoured, in terms of salary and status, than other persons employed in public service.

In Europe, teachers' salaries have increased in most countries since 1938, but the rate of increase has been slower for teachers than for office employees and manual workers.

SEÑORITA LUCIANA

Teacher in the High Andes

Luciana Luna Yabar, a 26-year-old teacher from Lima, the capital of Peru, was appointed to run a small school in the province of Cuzco for three years. Señorita Luciana's first problem was how to reach her isolated post. She took a plane from Lima to Cuzco and then spent an entire day in a bus which took her to Paucartambo, a village whose people live at a height of 3,500 metres (11,500 feet) in the heart of the Andes. Setting off alone on horseback across the vast Cordillera (right), she had to cross a mountain pass 4,800 metres (almost 16,000 feet) high. It was two days before she covered the 115 kilometres (70 miles) and reached the school located in the buildings of an abandoned farm. For nine months each year this is her home, until she returns to Lima for her annual three months' vacation. Luciana's pupils are Quero Indian children, aged eight to 13, whose parents—breeders of llamas, vicunas and alpacas—live anything from 20 to 40 kilometres (12 to 25 miles) away. Because of the distance they have to walk, the children stay at the school from Monday morning to Friday evening. Water for this austere "boarding school" comes from melting glaciers, and in winter the school is heated with fires of dead wood collected on the mountains. Luciana shares to the full the life of her pupils, and encourages and watches over their games and recreations (left). The children learn about hygiene and are taught Spanish (their own language is Quechua). They also learn to read, write and count in Spanish. Luciana has her own simple little room whose only furnishings are a wooden bed and a llama wool blanket. She earns 1,400 soles (£18 or $50) a month, and sometimes uses part of her salary to pay for school supplies.

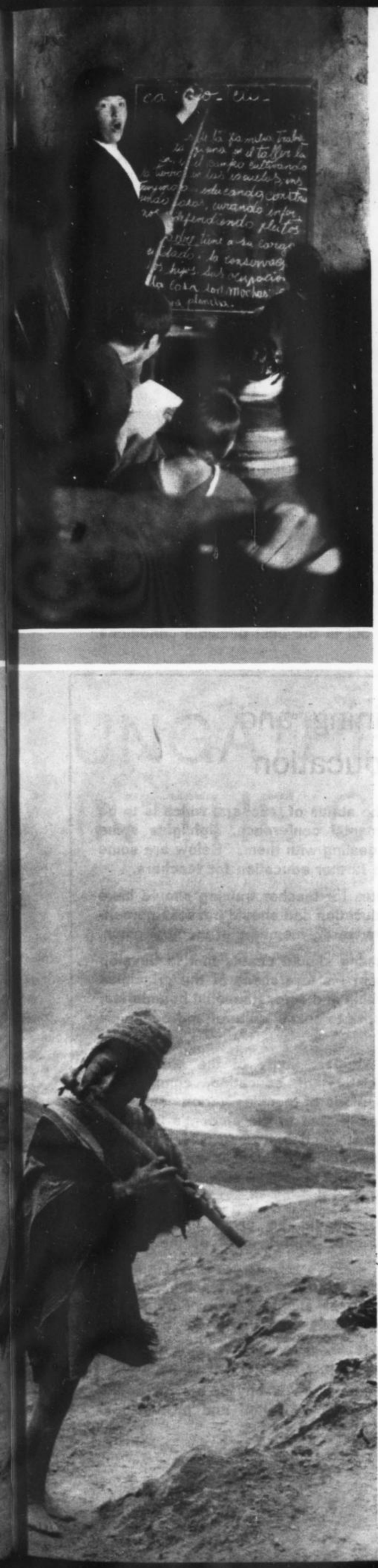
Photos © Institut Pédagogique National, Paris - Pierre Allard

CONTINUED ON NEXT PAGE

Mealtime at school (left). Every two weeks a man rides over from the nearest village, 110 kilometres (70 miles) away, to cut wood and peel potatoes. A stock of these vegetables—a staple item on the school menu—is provided by parents. Meals also include porridge and dried milk supplied by the Peruvian Government. There are rarely more than 10 to 12 children in school at one time, since parents often need their help in the fields.

Martin, the oldest boy in the school (aged 13), plays his flute on the high plateau. Rough stone walls in distance are corrals in which vicunas, alpacas and llamas are shut up for the night to protect them from pumas and bears. Different tunes played on the flute tell the herds when to enter and leave the corrals.

Photos © Institut Pédagogique National, Paris - Pierre Allard



Let's say good-bye to 'Mr. Chips'

and unselfishness, but who tends to be absent-minded, ingenuous and attached to old-fashioned principles.

It would have been surprising if this view had not coloured the ideas of teen-agers. They have, of course, other and more direct ways of forming an opinion about the teaching profession, since it is the one they know, or think they know, most about.

Some yougsters, inspired by admiration and enthusiasm for their teachers, are strongly drawn to a teaching career and their only ambition is to follow it themselves. But it must be admitted that such cases are relatively uncommon. Many others submit to their teachers' authority with impatience which shows itself in a display of emotions ranging from indifference to outright revolt. Later on they will perhaps think with affection of their former teachers, but more than likely this will merely be nostalgia for their own youth.

At an age when they are thinking of choosing a career, young people are often presented by the press, radio, cinema and television with more glamorous images of other jobs, which seem to them to be in tune with the world of today and tomorrow, jobs which appear more active and more "dangerous", but which offer greater prestige and greater possibilties of satisfying ambition.

There is room for a genuine non-propaganda campaign, to publicize and explain the role of the teacher. This is not the place to set out the particular points which should be emphasized; they are, however, well known to all who are familiar with the world of education.

It would be wrong, for example, to dwell on the sacrifices imposed by the teacher's calling or on the haven which the profession provides from the agitation of the restless world—points that have so often been stressed, in all good faith, in the past. Instead it should be pointed out how much the teacher contributes to the building of the world of tomorrow, by preparing young people for adult life and citizenship; to the intellectual and moral training of the makers of modern society and to economic and social progress. Teachers' associations, which defend their members' legitimate interests so conscientiously, might perhaps pay more attention to raising the standing of their profession in the public mind, and especially in the opinion of young people.

But it is, of course, up to the state to set an example, and it has simple, effective means at its disposal to do so. The recommendation to be submitted by Unesco to the intergovernmental conference deals with the question of teachers' salaries in the following terms:

"Amongst the various factors which affect the status of teachers, particular importance should be attached to salary, seeing that in present world conditions other factors, such as the standing or regard accorded them and the level of appreciation of the importance of their function, are largely

CONTINUED ON NEXT PAGE

World shortage of teachers

In 1950 the world had 5,347,000 primary schoolteachers. By 1962 their numbers had risen to 8,052,000.

Despite this increase there is still a serious shortage of teachers throughout the world. In 1963 this shortage was hindering the development of primary education in three-quarters of the 83 countries which replied to a questionnaire from the International Bureau of Education. Fifty-one countries were having to use staff without pedagogical training and 34 had been forced to introduce accelerated training for teachers.

The number of teachers in secondary education (general, technical and vocational) increased from 1,950,000 in 1950 to 4,300,000 in 1962. Nevertheless, the International Bureau of Education reported in 1963: "the shortage of teachers, particularly teachers with proper training and qualifications, gives rise to more anxiety than ever and is tending to become worse."

Teachers in higher education totalled 576,000 for 6,500,000 students in 1950; in 1962 there were 1,218,000 teachers for 14,000,000 students. The 1962 figures do not cover Mainland China, North Korea or North Viet-Nam.

The value nations place on education

dependent, as in other comparable professions, on the economic position in which they are placed."

Formulated in this way, the question has two aspects. Salary is certainly not the only factor to be considered in a concerted policy of teacher recruitment. We have seen how, for young people, the prestige of a career is dependent on other factors. It is not even sure that when young people choose their profession they know exactly what advantages it presents.

But it is also true that public opinion does seem to have acknowledged once and for all that teaching is badly paid. Well-intentioned people have tried to find solace in the idea that teaching is not so much a career as a mission, and that teachers must forego not only wealth but many other material satisfactions as well. As compensation for this, they point to the elation that comes from fulfilling a noble task and contributing to the development of youthful personalities.

One need hardly point out that there is a good deal of ignorance and hypocrisy in this reasoning. Why should young men and women at the very beginning of their working life renounce the legitimate ambition of obtaining a decent place in society for themselves and their families? A profession with the reputation of being badly paid holds little attraction for young people, even the most studious, and this again dissuades many excellent potential teachers from entering the profession.

Salary and other related advantages are, however, also a sign of the regard in which society, as represented by the public authorities, holds a given profession. It is illogical to declare that teaching is one of the most necessary of all public services, and at the same time to keep teachers as impoverished as they so very often are. Reliable statistics collected during recent international surveys prove that primary and secondary teachers—the former of course more than the latter—are incontestably among the most unfavourably treated categories of the working population.

In many countries, it is often said that anyone who goes into teaching must have lost hope of entering any other profession. How, then, can one hope to raise the prestige of a career, which is constantly so belittled? Fortunately conditions are not the same everywhere; but examples of such inconsistency are too frequent to pass unnoticed.

Teachers do not of course always work for the state: they are often employed by local communities or by private enterprise. But since it is agreed that teaching is a public service and that the education of young people is one of the state's major responsibilities, it is always the duty of the state to supervise the quality and operation of education.

The condition of the teacher is therefore the concern of states; this means that it is also the concern of Unesco, whose task it is to bring about continuing co-operation between states in the field of education. This is why Unesco has taken the initiative, why it has arranged for an international recommendation to be drawn up and why it has called an intergovernmental conference.

The question of salaries is not, of course, the only problem with which the recommendation deals; nor is it the most important one. Methods of recruitment, tenure, conditions of employment, retirement pensions and all aspects of social security are covered as well. Teachers' rights must correspond to a fair assessment of their duties and responsibilities.

A set of recommendations on the selection and on the intellectual, professional and in-service training of teachers must inevitably be associated with this code of rights and duties; for the status which the profession may justifiably claim depends on the care taken to choose and train its members in accordance with the highest criteria.

The aim of the international recommendation is not to provide special advantages for a particular group of people, but to guarantee that a service of public interest, of primary importance for the future of every country and of all mankind, should be carried out in the best possible conditions.

Better training and further education

The international recommendation on the status of teachers, which is to be examined by the special intergovernmental conference, highlights some major problems and suggests ways of dealing with them. Below are some of its proposals relating to training and further education for teachers.

ADMISSION TO TRAINING. Candidates for teacher training should have completed a well-rounded secondary education and should possess personal qualities likely to help them to become worthy members of the profession.

AIMS OF TRAINING. A teacher's training should enable him to develop his personal culture; his ability to teach; his awareness of the principles which underlie good human relations, within and across national boundaries; and a sense of responsibility to contribute to social, cultural and economic progress.

TRAINING PROGRAMMES. General studies; study of the philosophy, psychology, sociology, theory and history of education, comparative education, school administration and methods of teaching various subjects. Programmes should also include studies related to the student's intended field of teaching, and practice in teaching and extra-curricular activities carried out under the guidance of fully qualified teachers. All teachers should be prepared in general, special and pedagogical subjects in universities or in institutions of a comparable level.

FURTHER EDUCATION. A full place should be given to in-service education designed to secure a systematic improvement of the quality and content of education.

A wide system of in-service education, available free to all teachers, should therefore be established. Refresher courses should be provided, especially for teachers returning to their work after a break in service.

Courses should be designed to enable teachers to improve their qualifications and to keep up to date with their subject and field of education.

Facilities should be available to enable teachers to buy or borrow books and other material to improve their general education and professional qualifications.

USIS

Trawling, in which the net is dragged along the ocean bed, is still the world's most common form of deep-sea fishing.

Man's vast potential food reserve

UNGATHERED HARVESTS IN THE OCEAN

by Mack Laing

IN the thick of a world-wide struggle against hunger and malnutrition, man turns to the sea for food and finds how poorly he has named his planet—Earth. The connotation of Earth as a green world of plenty is being dimmed. Millions of her people are hungry and sick, and sick and well alike are being crowded rapidly toward the limit.

In 1930, there were 40 people per square mile of total land area; now there are 63; by the year 2,000 there will be 142. We have begun to realize as never before that only 30 per cent of the so-called Earth is land area. The rest is ocean, the only such ocean in our entire solar system.

Meanwhile we must feed a population that grows at the rate of more than 60 million a year. But only one-tenth of the earth is under cultivation and about two-thirds of that is grassland of varying quality. These are the main supports for our hungry millions. And while the land supplies grain, vegetables and fruits, it does not yield directly the animal protein that builds muscle and provides stamina for continued work. The conversion from vegetable to animal protein comes through livestock and this conversion costs us one-quarter of all crops and one-half of all the world's grain crops which go to feed animals.

Once again we turn to the sea. Here is a food-producing machine, automatic, sun-powered, so far unmanaged, a warehouse of high-quality food, withholding its wealth for the right combination of keys. It is estimated that, acre for acre, the sea can produce as much as arable land, yet the sea has twice the surface area of Earth's total land and seven times the area of land now under cultivation. Can the sea be unlocked to provide at least a partial solution to our hunger? Yes, definitely. Will the seas and inland waters someday outrival Earth's agricultural production and allow us greater breathing space on the land? Possibly, conceivably, too soon to tell.

The present situation in world fisheries has both optimistic and pessimistic notes. On the bright side, the world's fishermen now catch more fish than ever before. Each year since 1945 has provided a record catch. The 1964 catch—52 million metric tons—is double the 1953 catch. For comparison with land-grown animal protein, world fisheries production by 1962 was exceeding beef and veal production by 18 million tons and pork production by 25 million tons.

The discouraging part of these figures is that the fish is not being taken by those who need it most. First, between one-quarter and one-third of the 1964 catch was taken by only two countries—Peru and Japan. Second, only ten countries accounted for the top 62 per cent of the total catch. Finally, 95 per cent was taken by the leading 43 fishing nations.

CONTINUED ON NEXT PAGE

MACK LAING *is a staff writer in the Department of Fisheries, U.N. Food and Agriculture Organization, Rome.*

'Push-button' fishing with echo-sounder and television

There are about 220 independent or dependent countries or territories, but, even discounting those few which have no marine or even inland fisheries, these figures mean that perhaps 160 countries share only five per cent of the world fish catch.

This imbalance also shows clearly in a geographical distribution. Nearly 70 per cent of the 1964 marine catch was taken from four big areas in the northern hemisphere, the traditional fishing grounds of the northeast and northwest Atlantic and the west-central and north Pacific. These are the areas fished most by the countries which use the most modern fishing gear and methods. Protein deficient areas such as the Caribbean, parts of Latin America, Asia and Africa produced low tonnages and some proportion of even this catch was taken by far-ranging trawlers from the more developed fishing countries.

The reason for these discrepancies is simply development; industrialization. Since 1945 the technological revolution that cccurred with agriculture in the advanced countries long ago, finally hit the fishing business. Advanced nations soon had electronic sounding devices to locate fish schools. Shipyards produced better boats; new engines began to shrink sea distances. The textile industry came out with new synthetic fibres which made strong, rot-resisting nets. New refrigeration techniques made it possible to process fish at sea. Countries with established rail and road networks were able to distribute fishery products far inland, through extensive "cold chains" using refrigerated trucks and railway cars.

Meanwhile, without the skills, capital and industrial basis to seize these innovations and turn them into opportunity, the developing nations remained far behind in fisheries development. This is why an Icelandic fisherman accounts for an average annual catch of more than 100 tons, while an average fisherman in most tropical areas will take only about one ton of fish a year. Behind each Icelandic fisherman there are many thousands of dollars invested in boats, gear and training. In the developing countries we are trying to remedy this technological gap, with varying degrees of success, by sending technical assistance experts in specific kinds of fishing and by setting up entire fisheries institutes.

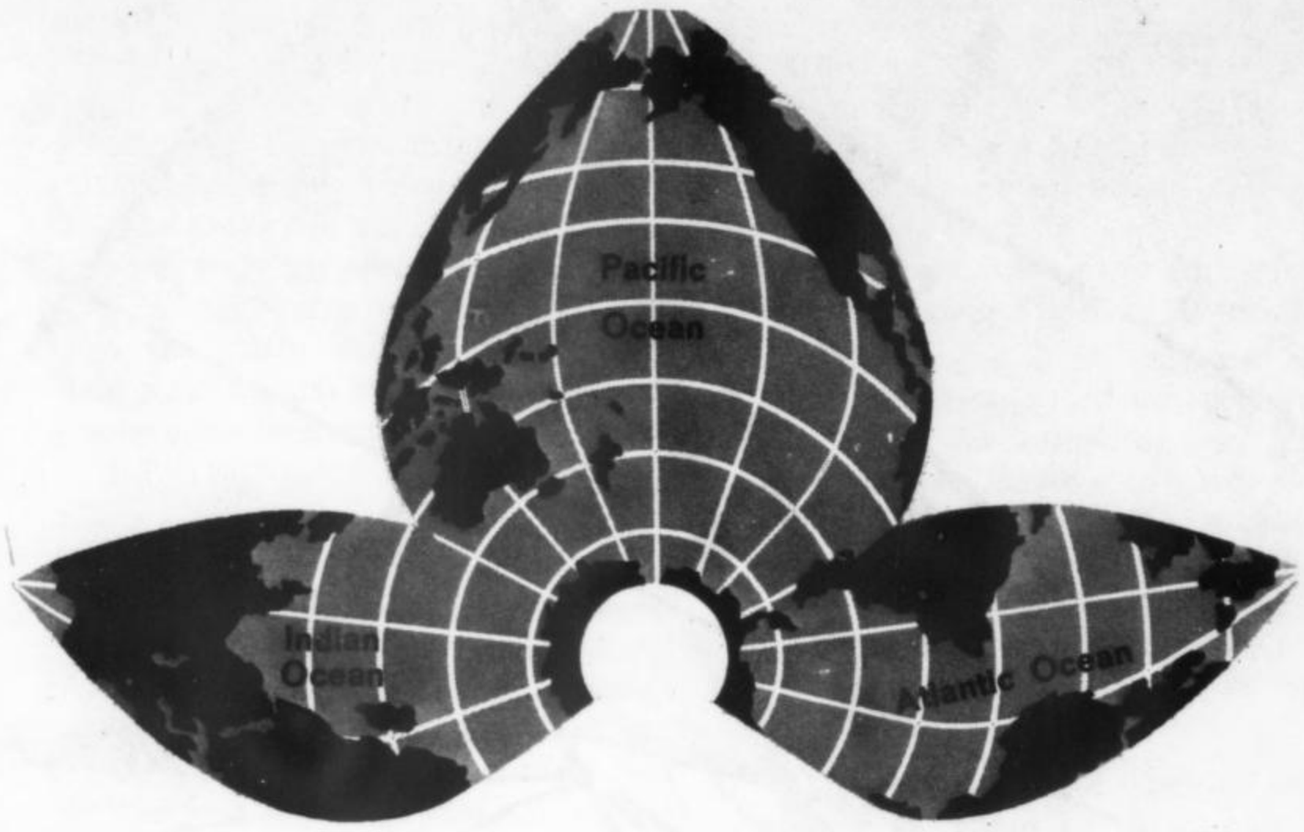
Meanwhile, the technological revolution advances, always outstripping the nations least prepared for it and in most need of its benefits. Great fleets of trawlers from Japan, U.S.S.R. and a few other countries now roam almost every sea, catching, freezing and transferring fish to shore bases or transport ships.

Some boats are able to operate almost in "push-button" style, finding a shoal of fish by Sonar, letting down a trawl and directing this net with the aid of television cameras mounted on the trawl mouth. The latest news in fishing boat design is that months of drawing and model-testing can now be avoided by programming an electronic computer to give "ideal" specifications for a boat of a certain type or size or for use in certain sea conditions. Again, in the developing countries, where the majority of the world's boatyards are, most boats are built from memory and rule of thumb, without even rough drawings.

If the waters of the world are now producing more than 50 million tons of food a year, how much more can they produce? The answer—"we don't know"—illustrates man's great ignorance of the sea. The sea's production may be very large, but it is not unlimited. It is limited by photosynthesis, the process by which tiny sea plants called plankton are able to grow by absorbing sunlight. Some attempts at measuring this growth rate have been made. By estimating the amount of plankton and its growth rate, the sea's "primary production" can be guessed at.

In 1961, two scientists estimated this primary production at 500 thousand million metric tons per year for all seas. In the sea's food chain we might assume that small, plant-eating animals feed off the plankton, are in turn eaten by a class of small fish, which are in turn devoured by larger fish. At each stage there is a certain

© H.W. Silvester, Lioux, France



Drawing © "Science and Technology"

Two-thirds of the surface of our planet is covered by seas and oceans, which combine to form a single vast world ocean. As this "petal" map-projection shows, all salt-water bodies, whatever their names, ultimately mingle around Antarctica. Below, hauling hard on their huge oars, fishermen set out for tuna fishing grounds off the Sicilian coast.

loss in material. Counting these losses, the estimated possible result from the original 500 thousand million tons of plant food would be one thousand million tons of fish.

But any estimate of primary production is bound to be weak. This is because the life processes of the phytoplankton at one place vary from hour to hour and season to season. It also grows at different rates in different areas. It is possible to calculate from some estimates that the world's catch of codfish requires seaplant production equivalent to 22 world wheat crops, which would mean, on the same basis, that the present world catch of fish brings man the equivalent of almost 100 times more primary plant protein than is involved in the entire agriculture of the earth.

Until better information is available, the U.N. Food and Agriculture Organization continues on its estimate that the world fish catch could be doubled without endangering basic fish stocks.

Many ideas—none so far very practical—have been advanced on how to increase our harvest of food from the world's waters. Since the best fishing grounds occur where upwelling currents bring bottom food up into the zone of light penetration where most commercial species live, it has been suggested that artificial upwellings should be created in the tropics, where few exist, by lowering nuclear reactors. The economics of this up to now have shown that there would be a tremendous energy waste.

Economics and physical laws also have hindered the use of electricity for marine fishing. Fish are attracted and stunned by a current, and electrical fishing has been known on a small scale in streams and shallow lakes for more than 50 years. But salt water dissipates a continuous electrical force, even with equipment generating 7,000 kilowatts—enough power to supply a small town. German engineers have reported success with a fraction of this power by sending a series of strong electrical pulses into the water. The German and Soviet fishing fleets have reportedly been experimenting with this technique.

The Russians have also apparently begun experimental attempts to catch fish with submarines and American scientists have predicted that fish could be lured with electronic sounds or chemicals and simply sucked into special holds in a ship's hull.

Whatever the limits of sea production, there seem to be no limits to the inventiveness of the new technology of modern fishing. The obvious

CONTINUED ON NEXT PAGE

Fish by any other name...

qualification to the new ideas is that most of them depend on a sound knowledge of fish behaviour, which we simply do not have.

One of the more immediate hopes we have is the mid-water trawl. The usual commercial trawl net is dragged along the bottom. But our charts of the shallow continental shelves, poor as they are, show there is not much bottom left which has not been trawled many times. Therefore, there would seem to be good prospects for a trawl which rides a considerable distance off the bottom. This type of gear is available but has seen no large-scale commercial use yet.

By far the most practical idea for increasing supplies of fish protein is simply to use the great quantity of fish now caught, but not used. Many species, because they look ugly or have harsh-sounding names, will not be accepted by consumers, despite their being excellent high-quality food. The "redfish" was one, until it was processed into fillets and rechristened "ocean perch", which now sells well. The same idea of dressing up the product as fish sticks or paste or other more attractive forms leads to more sales and more incentive to catch fish and avoid wasting its protein.

The other great force toward a sensible use of protein resources is inland fisheries. Nearly 12 per cent of the 1964 world catch came from fresh water. Just as important, nearly three-quarters of the inland catch came from protein-deficient Asia; Africa produced almost as much as U.S.S.R.; South America produced as much as Europe and more than North America. Again, in fresh water fisheries, we see an expanding technology, but this is backed up by centuries of experience in the Far East and, unlike the sea, there is a better possibility of controlling production conditions in inland waters.

In inland fisheries, it is quite within possibility that the waters can be "farmed" in much the same way as the land. Despite a good deal of futuristic talk, this is not so far practical in the sea. Yet, as with every idea in fisheries, our general ignorance has provided us with a wide range of opinion.

The optimists point to 17,000 different species of algae, plankton and seaweed, some of which can produce 50 crops a year, with almost 100 per cent of the plant usable as food. Kelp and other large seaweeds have been used for centuries, especially in the Far East, for fertilizer, fodder and human consumption. Algae or algae extracts are now used in Japan, for example, in bread, cakes, ice cream, soups, soap, explosives, cosmetics and toothpaste.

But when algae are offered as a large-scale solution to the hunger problem, the pessimists are quick to point out practical difficulties. To provide one man with enough calories for a day's work through algae, they say, would mean straining several thousand cubic metres of sea water. They say algal cells are so well protected by nature that man would not digest them easily. Again, until we know a lot more about the sea's grasses, that part of the ocean's warehouse which is the granary remains locked.

Another intriguing possibility for increasing world food supplies lies not in plankton, but in krill, a shrimp-like creature as long as a matchstick, which feeds on the plankton of the unexploited southern ocean. Unlike plankton and the problem of straining sea water to get at it, krill occurs in enormous densely-packed shoals. It is the main diet of the great southern whales, and, since whale stocks have been decimated by unscrupulous killing, the vast areas of krill have increased. In late 1962, solid data on krill distribution began to be published. The famous British scientist, Sir Alister Hardy, has said he is sure that krill will save the starving children of the world and that within 20 years krill may be making the greatest addition of the century to man's food supplies.

Husbanding of marine fish has already been tried. Young plaice have been raised in tanks from hatching, through the most dangerous part of their lives, until they are ready for release into the sea. A plant on the Isle of Man is expected to turn out a million fish a year.

© Siegfried Sammer, Berlin

Fishermen of Kerala, India, still use the type of fishing net shown above, introduced 18 centuries ago by Chinese merchants. Outdated techniques limit the catches of many countries. Ten countries alone—those which use modern fishing gear and methods —accounted for 62 per cent of the total world catch in 1964. Below, a whale-hunting vessel tows back its catch for processing in a factory-ship.

A technique tried 50 years ago to increase fish size was to catch young fish on overcrowded grounds and transfer them to richer grounds. Those transferred grew several times as large as those left behind. A scheme to make such transfers regularly, failed. No one nation was going to pay to release fish where other nations could easily catch them. International co-operation has improved since then.

One of the most unusual situations in world fisheries is the case of Latin America. Since 1957, Latin American fisheries production has increased nearly 1,000 per cent, while world production has increased only about 65 per cent. However, in at least half a dozen Latin American countries, fish production increased little or not at all, and in seven, including Mexico and Cuba, production increases have been about 50 per cent since 1957.

The key is anchoveta, a finger-length fish found in great easily-caught schools off western South America. On the strength of this little fish, Peru became the world's greatest fish producer in 1962, and Peru and Chile are responsible for 90 per cent of Latin American production and 20 per cent of the world catch.

Could the anchoveta contribute to the solution of Latin America's protein deficit? The theoretical case is very strong. In 1962, for example, nutritionists estimated that Latin America needed 1.2 million metric tons of animal protein annually. That year's Peruvian and Chilean fish catch totalled 7.5 million tons, which contained about 1.3 million tons of protein. However, considering that only half of this 7.5 million tons live weight would be suitable for direct human consumption, at least 40 per cent of the 1962 Latin American protein requirement could theoretically have been met by the catches of these two countries. On the same basis, it seems quite within the fisheries development possibilities of the continent to be able to provide, in theory, for all increases in protein demands by Latin America's expanding population over the next 20 years.

These figures are theoretical since, in fact, 95 per cent of the 1962 anchoveta catch, for example, was ground into fishmeal, most of it for export to United States and Europe as pig and chicken feed. In effect, Peru and Chile that year exported one million metric tons of animal protein to put pork and chicken on the tables of nations already well fed.

This example is not intended as any adverse comment on these countries, but is used merely to point out what the effect of fisheries economics can be on human nutrition. The economic fact is that Peru and Chile, desperately short of foreign capital, gained 110 million dollars from the anchoveta in 1962 and this money was invested for development, including fisheries development. The example is also used to illustrate the importance of fishmeal.

Late last year, the New York Times announced a "breakthrough" in the solution to the world food crisis—fishmeal for human consumption. It was said that studies indicated that if unharvested fish in American coastal waters were made into concentrate, this would provide the normal protein requirements for nearly one-third of the world's population for 300 days at a base production cost of half a cent per person per day.

In the manufacture, whole, fresh fish are pulped, then moved through a bath of cold isopropyl alcohol to eliminate most of the water and fat. They go through two more stages under hot isopropyl alcohol, stirring in kettles, and after drying, an off-white flour-like substance remains. This is fish protein concentrate. There are three types for human consumption, varying from 60 to 80 per cent protein. It can be mixed into bread, macaroni and other foods. Any "fishy" taste can be removed during manufacture.

It has been possible to make such a clean, safe, high-quality and cheap product for several years. So far it has been mostly manufactured for experiments, though recently several companies in Morocco, South Africa and the United States have begun selling it for institutional feeding at retail prices ranging from $170 to $350 a ton. Experiments at the Anglo-American Clinic in Lima, Peru, provide encouraging results of its effectiveness in combating children's diseases caused by protein deficiency, such as kwashiorkor.

It may be one of our best answers against malnutrition. But before we can throw it in full force into the fight, we need more economic and social data, particularly on its acceptability to consumers. We need nutritional data on how to use this concentrate in the daily dishes of various countries to improve diets. Some of these questions are under study at the FAO-founded Instituto del Mar in Peru.

Very recently two of our FAO Department of Fisheries staff members made an interesting calculation on the contribution fishmeal could make to human diets and the amount of fish required. They said that to increase the daily diet of one million people by five grammes of protein in the form of fish protein concentrate containing 65 per cent protein, an annual tonnage of about 16,000 metric tons of whole fish would be required.

Though this increase of five grammes of animal protein is small, it is still significant in some countries. For example, the average daily animal protein intake per person for Africa as a whole is only 11 grammes, of which only 1.3 grammes now comes from fish. A per person increase of five grammes of animal protein for all Africa would be a jump forward toward the short-term target of 18 grammes for the continent. The objective of this short-term target is elimination of under-nutrition and a reasonable improvement in nutritional quality of the diet.

The proportion of the total world catch reduced to meal and oils for animal feeds rose from 13 per cent in 1958 to 30 per cent in 1964, or 35 per cent if the world inland catch is excluded. It seems obvious that if we could upgrade some part of this animal

CONTINUED ON PAGE 32

© Norwegian Ministry of Foreign Affairs

BRONZE MINIATURES FROM ANCIENT SARDINIA

Hilt of a bronze votive sword, shaped in the form of a two-headed stag. The figure on its back is that of a god or a warrior.

Masterpieces of a little-known Mediterranean art

by Antonio Borio

SOME European countries and peoples remained little known in the past because their development was virtually confined, in range and influence, to their own regions. Situated on the fringe of the major currents of civilization, they were usually overlooked by the great chronicle of history. Today, however, we have come to recognize the significance of the forms of cultural expression which they developed through the centuries and millenia.

Sardinia is one of these countries. This great island, lying in the middle of the Mediterranean, was easy of

---

ANTONIO BORIO, *a professor of philosophy, is assistant director of the Italian Cultural Centre in Paris. He is the author of "Sardaigne" (Sardinia), a book about his native island (Editions Arthaud, Paris, 1957).*

Photos

access and exposed at all times to invasion (it has experienced no less than ten periods of outside domination). Yet paradoxically it has lived through a score of centuries almost always unaffected by the great changes of history, as though it were a remote corner of our planet.

Nevertheless, during the second millennium B.C.—well before the series of foreign occupations began with the arrival of the Phoenicians—an ancient and mysterious people, whose place of origin no one has been able to establish, created a distinctive form of civilization which lasted for at least a thousand years (from 1500 to about 500 B.C.). The sources of this civilization are bound up with the legend of King Sardus, the eponymous hero who, according to the Greek historian Pausanias, ruled over the first inhabitants of the island.

Curious traces of this civilization, developed in part through the influence of the richer and more mature cultures of the Eastern Mediterranean and Asia Minor, are preserved for us in the imposing truncated-cone constructions known as *nuraghi*, which have given their name to the whole of this historical period and are to be found by the thousand along the coast and in the interior of the island; and in a few hundred bronze statuettes, the now famous *bronzetti*.

CONTINUED ON PAGE 20

Bronze figures of the nuraghi period reveal the theocratic and military nature of the society founded by the ancient people of Sardinia.
Many statuettes of archers have been discovered.
Left, shouldering his bow, a man raises his left arm in sign of homage.
Right, an archer wearing a quiver slung across his back.
For protection he has a breastplate and an armoured apron.

Photos © Hugo Herdeg Erben, Zurich

Above, a tribal chief[illegible]t and r[illegible] a sword, a staff a[illegible] ritual [illegible] this 29 cm. (11 in.)[illegible]e rank[illegible] (seen from front a[illegible]ear) en[illegible]

Photos © Hugo Herd[illegible]ben, Zuri[illegible]

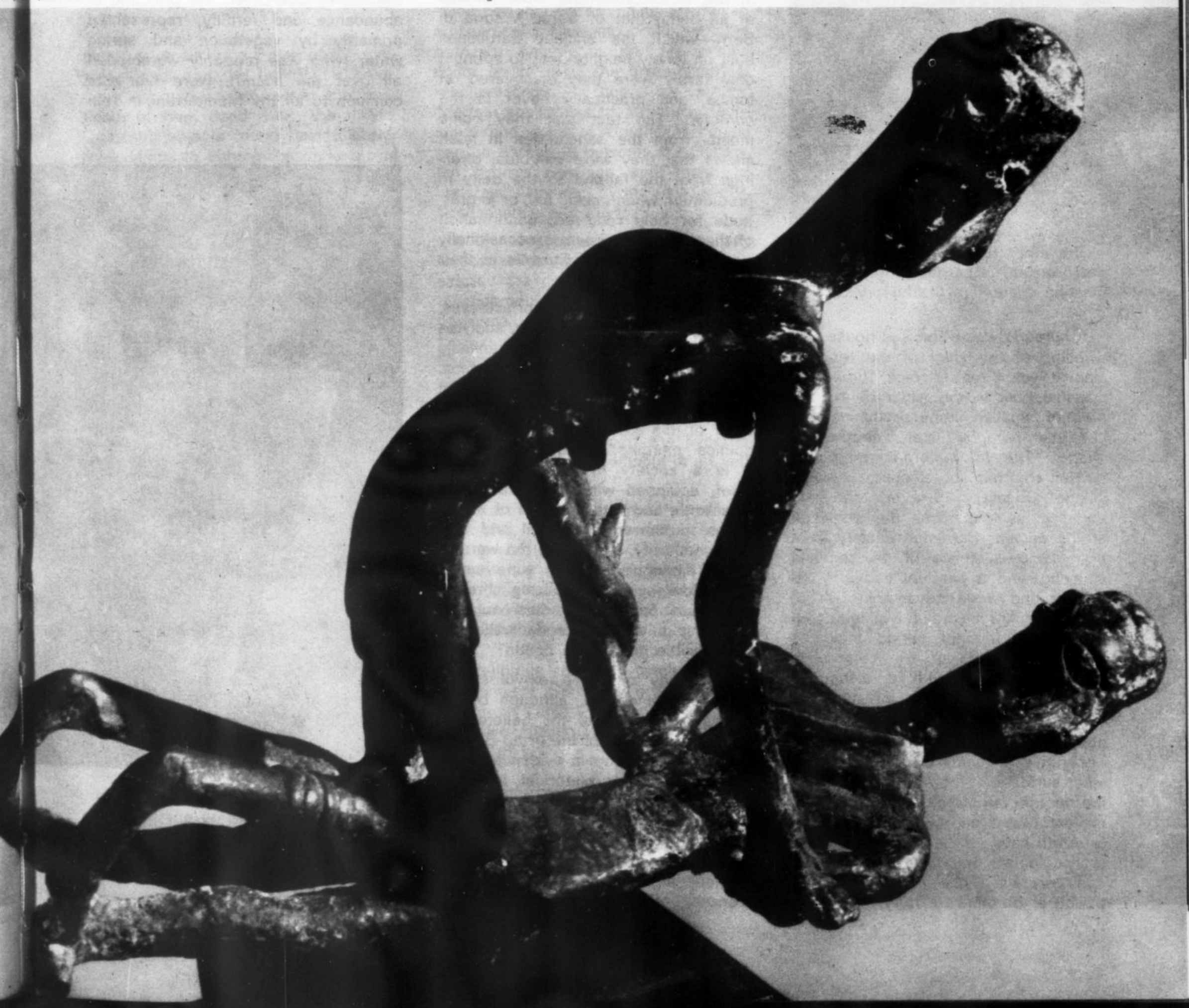
The Earth Mother goddess, also known in Sardinia as "the mother of he who was killed" (9 cm.; 3 1/2 in.). On her knees she holds the body of a youth—possibly a warrior or a youthful god.

THE ANCIENTS AND THEIR GODS

Right, two men engaged in a symbolic combat. Like most ancient peoples, those of Sardinia probably held tournaments and games during the celebration of rel[illegible]gious festivals.

hie and rear views) bearing his insignia of civil and religious authority: f a ritual sacrificial knife. With its balanced forms and proportions, in. e ranks among the masterpieces of nuraghi art. Right, a warrior t a ear) endowed with superhuman traits: four eyes and four arms.

erde.rben, Zurich



ACOLYTE BEARING OFFERING. The ancients of Sardinia offered up animals, food and drink to their gods.

The story told by the *nuraghi* and the *bronzetti* is perhaps the most fascinating chapter in the history of Sardinia.

A *nuraghe* was a fortified house, the dwelling of the chief of the tribe or clan; it was a real fortress, rearing its massive bulk in the midst of a complex of smaller stone buildings, all, like the *nuraghe* itself, circular in shape. The whole formed an actual hamlet, an urban settlement (a "nuraghi village" in fact), which, one can reasonably assume, marks the transition of the ancient Sardinian society from a nomadic existence of plunder and violence, and a pastoral economy, to a new and more advanced form of community life, based on a mixed economy. The nuraghi period indicates the first instance of an autonomous Sardinian culture with a distinctive structure and purposes of its own.

While, in view of the complete absence of graphic evidence and of decorative elements on the outer and inner surfaces of their cyclopean walls, the *nuraghi* tell us very little about the ancient island people, studies of the *bronzetti* have on the contrary enabled archaeologists and historians to shed some revealing light on this interesting period of Sardinia's history.

Four eyes—symbols of shrewdness and foresight

There are about 400 of these small bronze sculptures, most of which are kept at the National Museum in Cagliari, the capital of the island. They vary in height from 8 to 30 cm. (3 to 12 in.); some are broken, but despite the long erosion of time, they are in an excellent state of preservation.

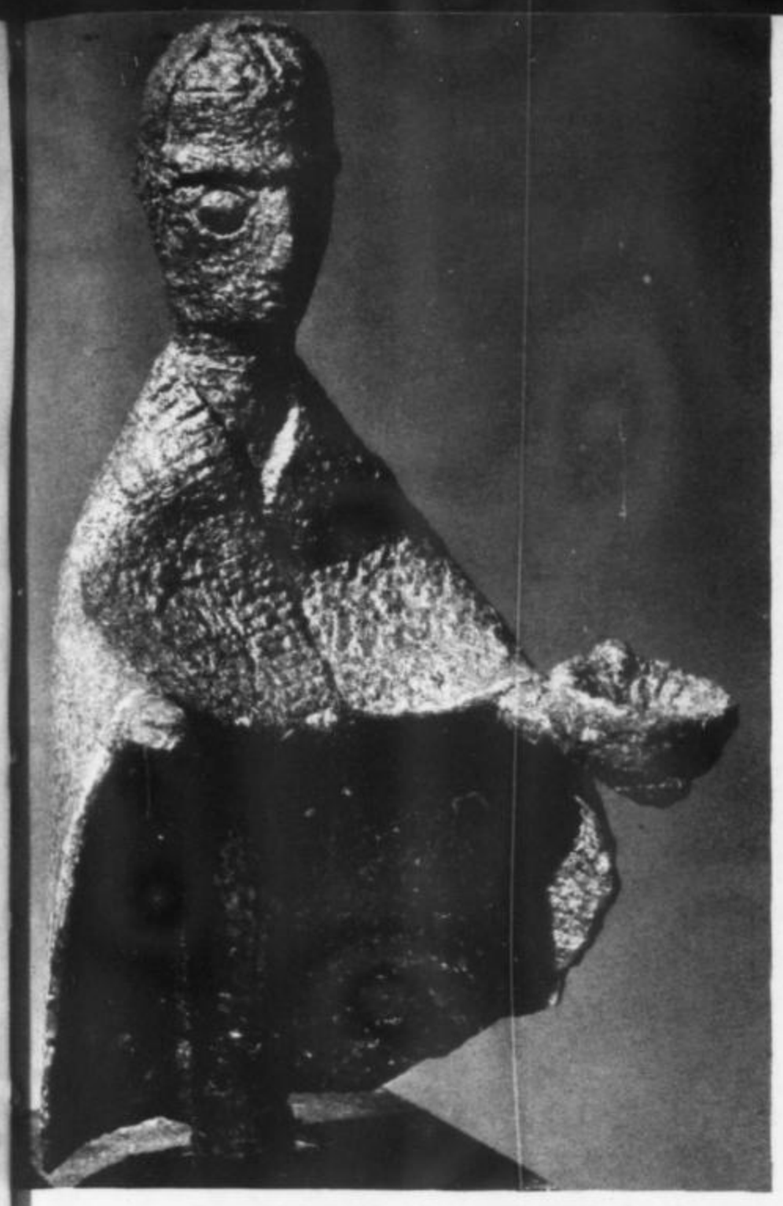
These statuettes were found chiefly in the sanctuaries—the most famous of all being that of Santa Vittoria di Serri—which the ancient Sardinians built on lonely heights near to springs; only rarely were they discovered in tombs, and practically never in the *nuraghi*. The fact that they come mostly from the sanctuaries in itself shows that they were *ex-votos*, offerings from the faithful to the deity in propitiation when asking aid, or in gratitude for help received; confirmation of their votive purpose is occasionally provided by insertion fitments in their bases.

Tribal chiefs, priests and priestesses, warriors, wrestlers, musicians, acolytes bearing offerings of cakes or animals to the deity, small funeral ships, dagger and sword hilts have been found. The theocratic and military character of this society, with religion and politics merging, is quite apparent. It is a society in which the tribal chief, equipped with the ritual sacrificial knife and with the staff of office, unites in himself both civil and religious authority, and where the warrior, often distinguished by superhuman traits (four eyes, symbolizing shrewdness and foresight), holds out his shield as a sign of its dedication to the invisible god.

The study of these *ex-votos* has given us some idea, although by no means a full one, of the beliefs and religious practices of the proto-Sardinians. Without graphic evidence, religious literature or historical information, we must resort to the comparative method, looking to the religions of Asia Minor and the Central and Eastern Mediterranean to throw light on the religious significance of most of the bronzes. Along with the statuettes depicting priests and priestesses, with their right hands raised in adoration, acolytes and offering-bearers, we find representations, often in limestone or basalt, of the Great Goddess, sometimes supporting on her lap a young dead god.

Associated with this basic cult of the Great Goddess, the Earth Mother, the mighty Life-Giver, the principle of abundance and fertility, represented primarily by vegetation and spring water (who was probably worshipped all over the island), were elements common to all the Mediterranean reli-

THE GODDESS MOTHER. An abstract sculpture in stone of the giver of abundance and fertility (42 cm.; 16 in.). This cult came originally from the Orient and spread throughout Sardinia.



PRIESTESS offering up a drink to a divinity.

gions, such as the survival of the individual soul and the belief that death does not permanently sever the relations of the dead with the living. Domestic objects found beside skeletons, lamps to lighten the darkness of the grave, bowls for use in the preparation of the dead man's food, and little ships symbolizing his long journey through the kingdom beyond the tomb —all these are proof of such a belief.

Certain practices also testify to the fact that these peoples believed in the continuance of relations between the living and the dead; an example of this is "incubation": a prolonged sleep, even lasting several days, near the tombs hollowed out from the rock (the *domus de janas*, or "spirit houses", as the country people still call them), the aim being to obtain either the cure of illness, or revelatory dreams.

Clothing, religious feasts, propitiatory rites, and offensive and defensive weapons all help us to build up a picture of the theocratic and military structure of the nuraghi society, as it may be deduced from a careful analysis of these little sculptures.

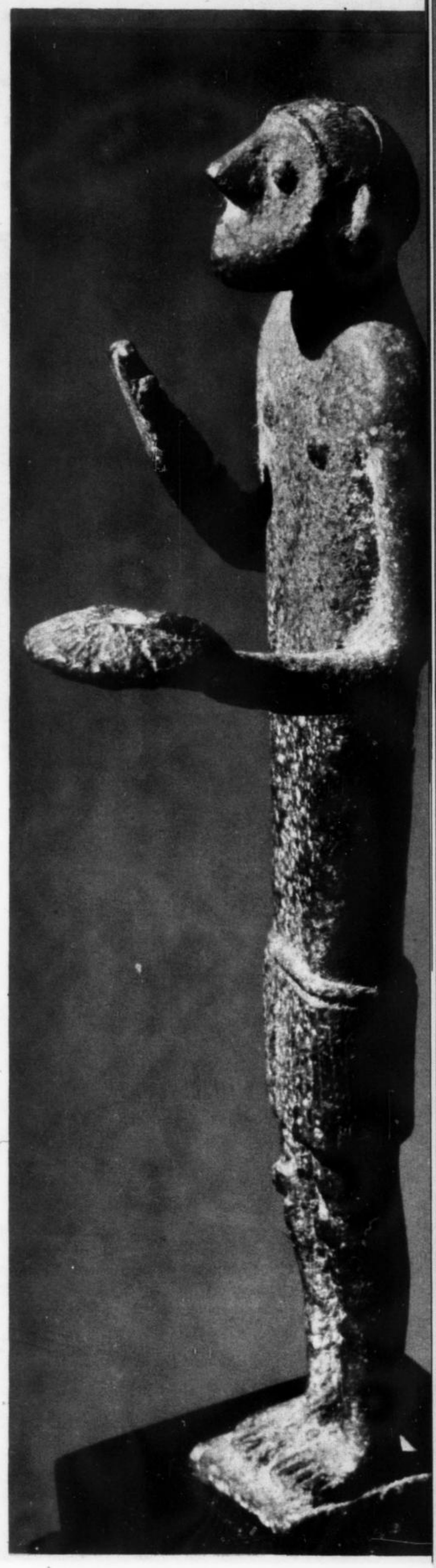
Historians and art critics began to be interested in the *bronzetti* at the end of the eighteenth century, when the German archaeologist, J.J. Winckelmann, a theorist of neo-classical taste, summarily dismissed them, for appearance and workmanship, as "quite barbaric" *(ganz barbarisch)*. No less negative was the opinion expressed by La Marmora, the first great modern historian of Sardinia, in the first half of the nineteenth century. Today, criticism has revised its view of these ancient examples of the Sardinians' skill in the plastic arts, considering them quite rightly as some of the liveliest expressions of late neolithic art among the peoples of the Mediterranean. The absence of monstrosities emphasizes the poise and restraint of their figurative imagination.

Unlike the rudimentary pottery of the nuraghi civilization, which repeats the motifs of geometrical design (ribbons, dog-tooth patterns and concentric circles), characteristic of the late neolithic pottery of the Eastern and Western Mediterranean, the *bronzetti* bear witness to an original stream of artistic development, clearly distinguished from similar art forms in the Mediterranean regions.

As for their dating, a few decades ago it was thought, that the *bronzetti* went back to the second millennium. Archaeologists now date them from the first millennium, linking them with the archaic geometric sculpture typical of the Graeco-Latin figurative arts of the same period. According to the Italian archaeologist Massimo Pallottino, the *bronzetti* belong to the pre-archaic minor sculpture of the proto-historical Mediterranean. "Thus", he writes, "certain similarities of structure, technique and even of significant details can be perceived between the Sardinian bronze figurines and those of Luristan, Armenia, Syria, Asia Minor, Greece, Italy and Iberia."

It is not possible, however, to say for certain which of these art regions exerted the greatest influence on the development of paleo-Sardinian plastic forms. The geometrical style could have been imported from Syria by the Phoenicians. On the other hand, the discovery, in the so-called "tomb of the leader" at Vetulonia, of a beautiful little bronze ship, clearly of Sardinian inspiration, may support the hypothesis that there were contacts in art with Etruria.

Nevertheless, it cannot be denied that the nuraghi culture possessed strong artistic feeling. The merits and significance of the creations of primitive man cannot be judged by the standards of the academic formalism prevalent among archaeologists in the past. Though concerned with conveying religious reality in symbolic form, the ancient Sardinian artist was undoubtedly able, with marvellous instinctive feeling, to create authentic works of art.



A WORSHIPPER raises his right hand in reverence, as he makes an offering of food.

Photos © Hugo Herdeg Erben, Zurich

THE YEARS OF THE QUIET SUN

© APN

Dressed warmly against the cold, a mountain-top observer of the Soviet Far Eastern Solar Service studies the rising sun.

Scientists in all parts of the world are today studying the results of a vast international research programme into solar activity and its influence on the earth. Here two Soviet geophysicists describe how in 1964-65 the world became one vast laboratory in which scientists from over 70 countries joined forces in a co-ordinated effort to learn more about solar-terrestrial relations.

by Nicolai Pushkov and Boris Silkin

TO the uninitiated, the phrase "years of the quiet sun" may have an odd sound, remindful of some ancient calendar of the East, perhaps of a poetic figure of speech. Yet it happens to be a strictly scientific term which is applied to a great scientific project, recently completed and widely reported.

Men have looked up to the sun as the source of life since the earliest times, and the worship of the sun lasted in many lands until men learned to look for rational explanations of natural phenomena. The sun-god Ra of the ancient Egyptians; Helios, identified with Apollo, worshipped in ancient Greece and Rome; the merry Yarilo of the ancient Slavs (the god of the life-giving forces of nature)—these were all held to be incarnations, or embodiments, of the sun.

Centuries were to pass before men learned to base their knowledge on facts rather than faith, and it was only during the Renaissance in Europe that they began to test and experiment in various fields of science. In 1609 Galileo Galilei may be said to have rediscovered the heavens when he first trained his telescope on the moon.

Three and a half centuries have rolled by since then, and we may ask ourselves the question: What have we learned about the sun since those times?

We have learned, for one thing, that the sun does not always remain changeless but is subject to periods of greater or lesser activity. Sunspots, noticed in antiquity and observed by Galileo, appear upon its face with definite regularity, their number increasing over a period of three or four years, after which they decay, solar activity sinks to a minimum, and the sun remains relatively undisturbed. This quiet period continues two or three years after which solar activity again begins to increase. The entire cycle—from one maximum to another—is completed in a little over 11 years.

Other phenomena besides the sunspots are subject to these cycles: the faculae, or bright regions of the sun's photosphere; chromospheric flares; and prominences, or tongues of flame, leaping hundreds of thousands of kilometres high over the solar surface.

These various phenomena are important and hence of great interest to the scientists. Moreover, they are of no mere academic interest, for the construction of some new hypothesis, for example. Nor is it only that the sun is our nearest star and the only one that admits of direct observation, being merely 150 million kilometres away, whereas the nearest other stars

CONTINUED ON PAGE 24

NICOLAI PUSHKOV, *a prominent Soviet geophysicist (and winner of the Lenin Prize) is director of the Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation of the U.S.S.R. Academy of Sciences. He is also a vice-president of the Committee for the International Years of the Quiet Sun (IQSY).*

BORIS SILKIN, *an eminent researcher, is a member of the Soviet Geophysical Committee (Presidium of the U.S.S.R. Academy of Sciences). He took part in the International Geophysical Year and the IQSY, and has written books and studies on these international research projects.*

The cycle of solar activity

1954 A YEAR OF THE QUIET SUN

1958 A TIME OF INTENSE SOLAR ACTIVITY

1964 THE SUN IN ITS QUIET PHASE AGAIN

Photos McMath-Hulbert Observatory, University of Michigan, U.S.A.

Concerted effort by thousands of scientists

are hundreds of thousands of times more distant.

It is the continuous and varied influence of the sun on the earth that explains our interest, rather than the fact that observation of the sun advances stellar astronomy.

Everyone is familiar with the interferences that frequently occur in radio transmissions. The local broadcasting station that regularly comes over so clearly all at once begins to fade out and another station, possibly unidentified and far away, comes in. This is all very well if one has been tuned in to a programme of music, but quite another thing in the case of a radio beacon, for in that event ships and aircraft may face distress as a result of confusion in the ether. Or, to take another example, the needle of the compass on which you are accustomed to rely may unexpectedly begin to swing away from a given point, and here again the results may be serious.

In both cases solar phenomena are at the root of the trouble.

Solar activity, therefore, and solar-terrestrial effects require painstaking observation. We need to know more about the various solar phenomena and to learn how to deal with or, rather, adapt ourselves to the effect of the turbulent activity of the sun that has so direct a bearing on our existence.

The recent international geophysical year (IGY) was a good example of such observation. Within the framework of its 1957-59 programme a great deal of valuable information was obtained concerning the various terrestrial physical processes and the nature of solar-terrestrial relations. As a result, we have improved our conceptions with regard to our planet's environment.

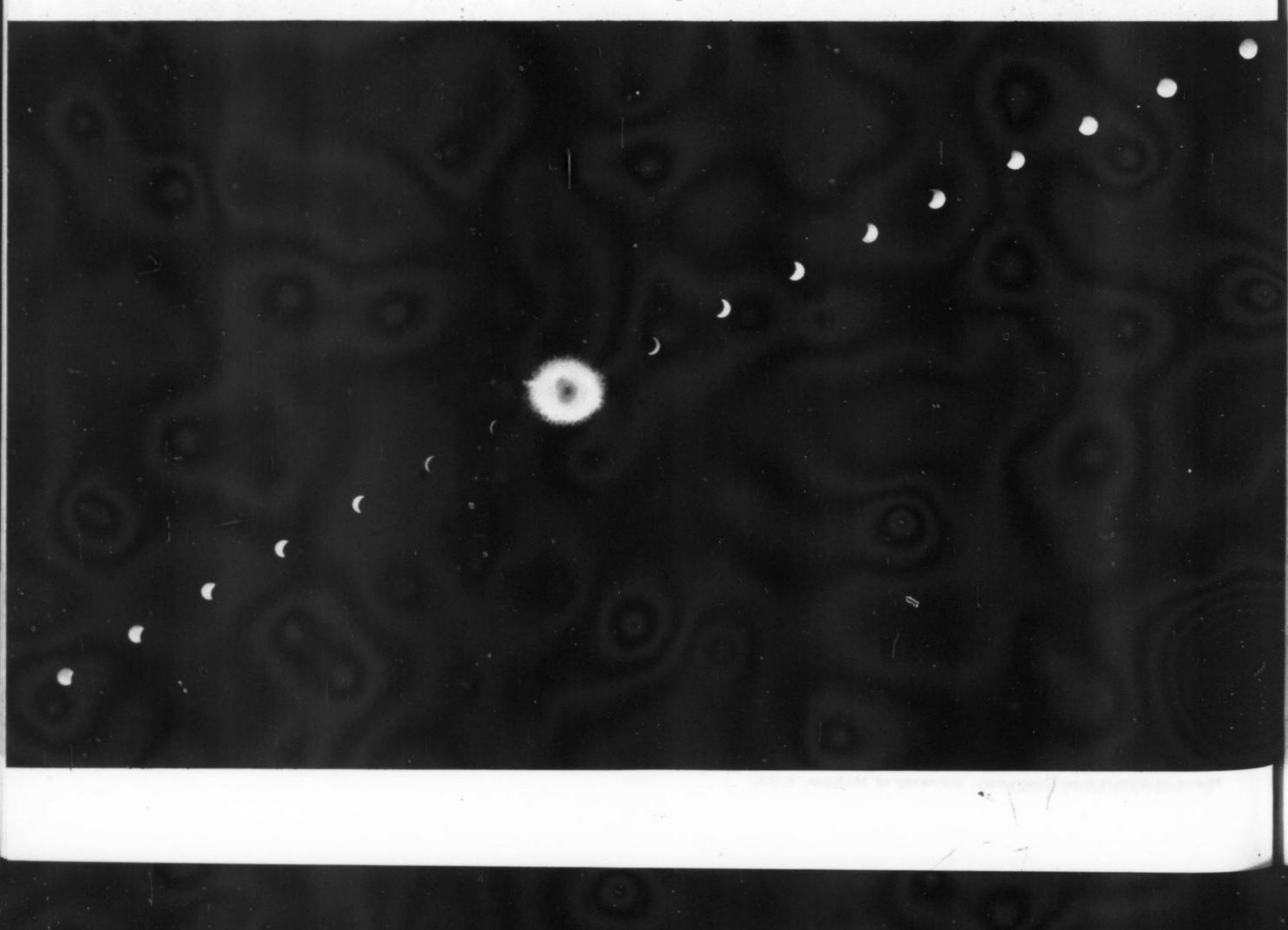
Valuable as this mass of information may be, its accuracy must be proved by comparison. The IGY happened to coincide with a period of extremely high solar activity. In order to arrive at definitive conclusions, however, we must observe the sun in the less disturbed phase of its cycle as well.

While science has so far been unable to discover precisely what is responsible for changes in solar activity, scientists have learned to forecast such changes quite accurately on the basis of the 11-year cycles. Inasmuch as 1957-59 had been a period of maximum solar activity, they were able to predict a period of lessened disturbance in 1964-65.

This prediction gave rise to the idea of organizing an International Years of the Quiet Sun project, or IQSY. When the idea was broached in 1960 by some Soviet scientists, it gained the immediate support of geophysicists from many lands, convened for the Geophysical Conference at Helsinki. It had become quite clear that the physical phenomena caused by solar activity are on such a scale that they must be studied on an international level, for no amount of restricted, national observation could cope with the problem.

These physical phenomena affect the earth as a whole, and if any reliable conclusions were to be reached, it was obvious that scientists would have to work within the framework of an internationally integrated programme and familiarize themselves with data collected all over the world.

If a chemist or an historian needs to know what his colleagues in other countries are working on, even if simp-



Astronomers study a greatly magnified image of an area of the sun. Image on the screen has been reflected and focused by a series of mirrors on a giant observatory telescope. Images are also analyzed with spectroscopic instruments to determine the nature of the sun's gases.

To study the corona of the sun, scientists take advantage of every total solar eclipse —the only time that the corona (a zone of very thin gas stretching for millions of miles) can be seen really well. Photographs on opposite page, taken at ten minute intervals, show all the phases of a total eclipse. Flareout of light from middle image is the solar corona.

Photos USIS

ly to avoid duplication of research and to profit from discussion so as to get the right answers, it is doubly important for the geophysicist to do so, for the object of his study is the earth as a whole. Uniformity of experiment, co-ordination of observation and comparison of data collected are of fundamental importance to the geophysicist; without them it is impossible to unravel phenomena of a universal nature.

In line with the IQSY programme, our planet became one vast laboratory for the scientists to work in. Thousands of geophysicists from more than 70 countries joined forces in a co-ordinated effort to solve the riddles of nature. The project received full support from Unesco and WMO, as well as various international bodies of astronomers, physicists, radiophysicists, geodesists and geophysicists; the committee for space research (COSPAR) of the International Council of Scientific Unions and the Special Committee on Antarctic Research (SCAR). W.J.G. Beynon of Great Britain, who was put in charge of the entire project, was requested by the International Committee on Geophysics to work out the general programme of research.

Academies of sciences and other similar institutions in dozens of countries also responded to an invitation to participate in the IQSY, thereby assuring the representation of the five continents, all the climatic zones, many different scientific trends, and countries with very different levels of development, including those with a history of many centuries and those who have just embarked on programmes of economic and scientific development.

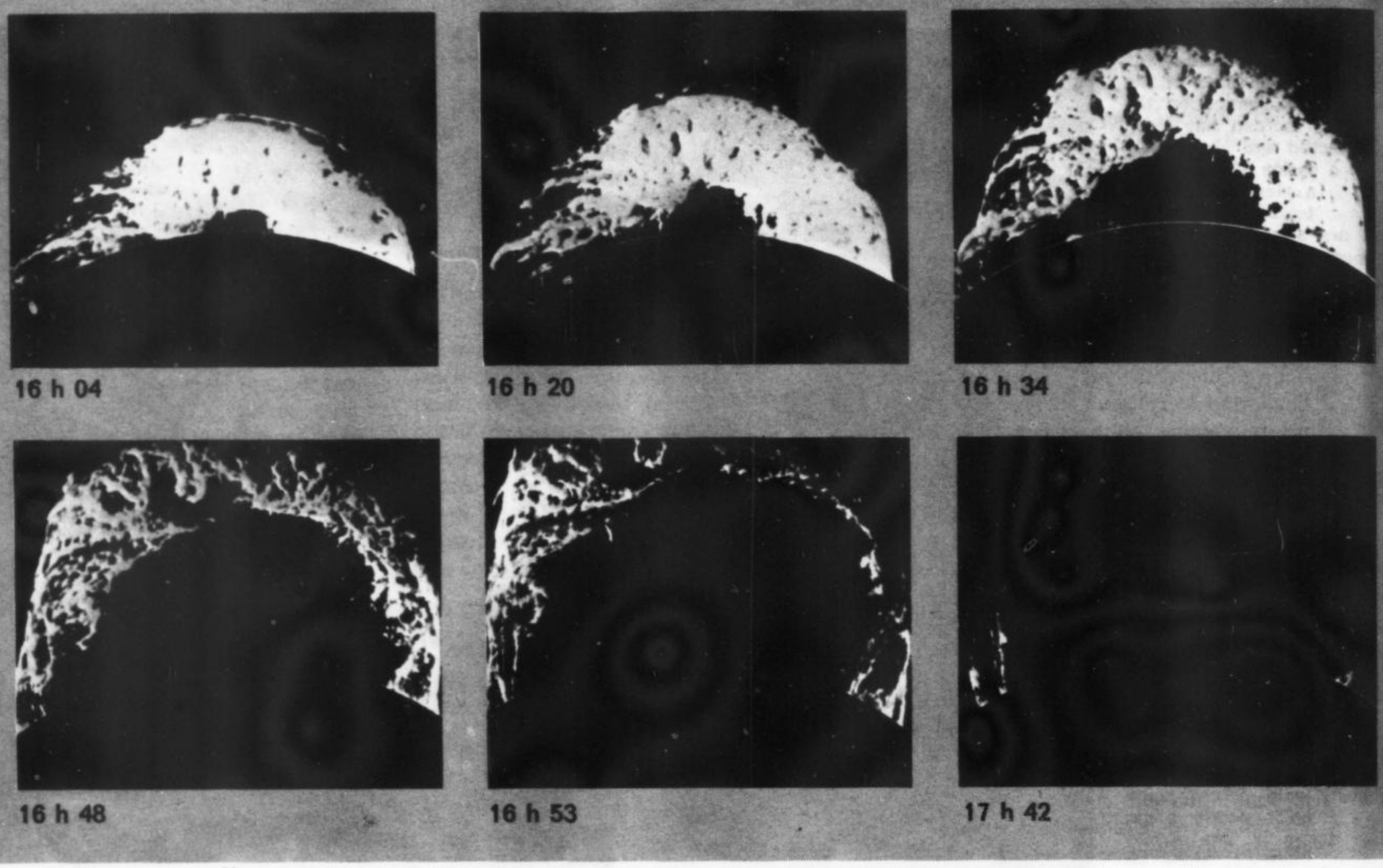
Japan and Australia are first to greet the rising sun, and the astronomers of the Tokyo Observatory train their telescopes upon it. As the earth turns upon its axis the sun comes under the observation of the Soviet Far Eastern Solar Service situated on the banks of the Ussuri. An hour or two later this observation is taken up by astronomers in Irkutsk, Alma-Ata, Tashkent and Delhi. As the sun rises over the Caspian it comes within view for Azerbaijan scientists at Perkuli, near Baku, and their Georgian colleagues in the hills of Abastumani. They are soon joined by Kislovodsk, then the Crimea, the town of Krasnaya Pakhra near Moscow, Kiev and Lvov.

The sun is then passed on, as it were, to the astronomers of Potsdam, in the German Democratic Republic, Plzen in Czechoslovakia, Ljubljana in Yugoslavia, Wroclaw in Poland, Pic du Midi de Bigorre in France, and Greenwich in England. On the other side of the Atlantic telescopes are ready for it at the Smithsonian Observatory at Washington, Arecibo in Puerto Rico, Boulder in Colorado and Sacramento Peak in New Mexico, U.S.A., Tonanzintla in Mexico, and Ottawa in Canada. South of the equator, meantime, the watch is carried on, successively, in South Africa, Argentina and Peru, until finally the sun plunges into the Pacific, to rise again over the eastern fringe of Asia.

We have already remarked that the IQSY was not an astronomical project, for we were interested in the effect of solar-terrestrial inter-relationships here, at this end; we wanted to know what kind of impact solar phenomena have on the earth. Astronomical observation of the sun, important as it was, served the participants in the project merely as a point of departure in their work.

The polar regions of our planet are —more than any other—of interest to the geophysicist, for it is here that the poles of the spherical magnet on which we live are found. It is here that the magnetic storms and polar

CONTINUED ON NEXT PAGE



QUIET SUN *(Continued)*

aurorae produced by the intrusion of charged particles out of the cosmos give displays of particular force. Here, also, we can observe the very peculiar behaviour of the upper charged layer of the earth's atmospheric envelope, the ionosphere, which reflects incoming radio waves. And here, finally, above the endless icy wastes great currents of air often form that affect the weather and climate in even very distant areas.

All these phenomena are directly or indirectly connected with the whimsical moods of the sun and the nature of the electromagnetic and corpuscular radiation emanating from it. To gain a complete concept of the interrelationships of the earth and its nearest star, therefore, it is necessary to start with observations carried on in the polar regions, where the various features of that concept are particularly characteristic.

That is precisely the reason why the attention of the scientists was focused on the work of the northernmost outposts of IQSY at the stations North Pole 12, North Pole 13 and North Pole 14, whose teams carried on through the snowstorms of the endless polar night, studying magnetic storms and polar aurorae in the high latitudes of the Arctic and observing the propagation of radio waves and the behaviour of cosmic rays when the sun is undisturbed.

The Antarctic ice-cap at the other pole was made the subject of similar study. At Vostok Station, near to the earth's magnetic pole and cold pole, Soviet scientists enrolled in the project carried on through the winter despite temperatures of 80 degrees Centigrade below zero.

The world's coldest continent became the land with the highest percentage of scientists, a scientists' continent, where co-operation among the specialists from the participating countries reached a record high. At Vostok station and the Mirny Observatory, Soviet scientists worked together with their American, French, German Democratic Republic, Czechoslovak and Hungarian colleagues, while Soviet geophysicists wintered and worked at the American McMurdo station. This fruitful collaboration made it possible to achieve higher levels of perfection in the various schools of science and increase our common fund of knowledge.

Each participating country carried out its own national project, set up within the framework of the overall programme. Considerably more than one hundred "Cosmos" type satellites were launched under the Soviet programme to carry out a wide variety of observations in circumplanetary space, precisely where solar phenomena have their first impact on our planet.

Four "Electron" type satellites were launched in the U.S.S.R. specially for IQSY purposes, whose orbits, drawing alternately away from and closer to the earth, covered an extensive part of its immediate environment and were thus able to establish with greater precision the pattern of its magnetic field, to study the streams of particles ejected from the sun and its X-ray radiation, to capture micrometeorites, to study the electrons present in the earth's radiation zones —discovered by American and Soviet scientists under the IGY programme— and to determine the chemical composition of cosmic rays.

American scientists launched several "Explorer" type satellites under the IQSY programme which they used to measure the magnetic field of charged particles; to classify electrons by the direction of their movement and the size of their charge; to study cosmic rays and the recently discovered "solar wind", or particle stream, that fans the earth; and to measure the density of the terrestrial atmosphere on its outer fringes, i.e. where it merges into cosmic space. The American "Oso" and "Ogo" type satellites collected information on the genesis of solar flares and the nature of the particles launched into the cosmos from the solar surface at their genesis.

British "Ariel" type satellites were

CATACLYSMIC ERUPTIONS

Above the surface of the sun is a layer of lighter and cooler gas called the chromosphere, so named because it gives out scarlet light. Great streams of glowing hydrogen called prominences often shoot through the chromosphere, sometimes for hundreds of thousands of miles. Left, the largest of these cataclysmic solar outbursts ever observed (on June 4, 1946). It expanded like a giant fiery bubble, reaching its maximum height in the fifth photograph. Forty-nine minutes later (last photo) it had almost disappeared. (Numbers indicate time when each photograph was taken.) Violent, but short-lived, solar flares also appear on the sun's surface. These send out electrically charged particles which on reaching the earth affect the compass needle and interfere with radio transmissions, causing fade-outs. When they collide with atoms and molecules in the earth's atmosphere, these particles also produce the auroral displays (right) chiefly seen in polar regions.

USIS

used to measure micrometeorites and to carry out experiments to determine the behaviour of ozone, the "brittle"gas whose genesis in the atmosphere depends on the ultraviolet rays of the sun. "Alouette", the Canadian satellite sent up into the ionosphere, was used to establish the relationship of the ionosphere with the genesis of polar aurorae.

Needless to say, the IQSY programme covered much more than the cosmos: a worldwide network was set up, comprising 240 scientific stations and laboratories for measuring the earth's magnetic field, 180 stations for observing polar aurorae, 270 stations for probing the ionosphere, close to 1,000 meteorological stations for studying the atmosphere, climates and weather, 105 stations for capturing cosmic rays, 110 observatories for recording the solar manifestations responsible for all this diversity of phenomena.

In addition to the cosmic experiments already mentioned, land-based Soviet geophysicists, for instance, effected their observations with the aid of a vast network of stations stretching from the country's western boundaries to the Soviet Far East and from the Kola Peninsula beyond the Arctic Circle and Yakutia to Transcaucasia and Central Asia.

Thousands of Soviet geophysicists attached to the Academy of Sciences of the U.S.S.R. and the academies of many of the Union republics joined this fact-finding scientific campaign. The country's foremost universities co-operated in the effort to penetrate the mysteries of solar-terrestrial effects—teachers, researchers and enthusiastic students, the future geophysicists, all joined in this work. No small contribution to the IQSY was made by the scientific bodies of the Soviet Meteorological Service.

The Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation (of the U.S.S.R. Academy of Sciences) brought into prominence as an IQSY centre the small town of Krasnaya Pakhra near which it is situated in the Moscow countryside.

One of the Institute's departments was continually on the move—the schooner "Zarya", the world's only non-magnetic vessel. The "Zarya" carried the IQSY flag over tens of thousands of miles, as it sailed the Baltic, North, Greenland and Norwegian Seas and the wide reaches of the Atlantic Ocean down to the equator, sounding and measuring to procure the data to be used for making precision marine charts of magnetic declinations.

A very extensive network of scientific stations and observatories was deployed by the geophysicists of the U.S.A. to carry out the diverse observations provided for by the IQSY programme. This network covered the country from Point Barrow in Alaska down to Cape Kennedy in Florida.

Work upon the project was also carried on by American scientists in Antarctica: at the McMurdo Observatory, at eight stations built specially for electromagnetic observation, and at the Amundsen-Scott Station, situated at the geographic South Pole, or as far down as one can go on our planet.

Interesting experiments in the field of polar aurorae and cosmic rays were carried out in the southern ocean by the American expeditionary vessel "Eltanin". In many lands as widely scattered as Iceland, South Africa, Morocco and Japan, American scientists carried on observations in co-operation with local geophysicists.

British scientists carried out their study of atmospheric physics and various weather phenomena in their relationship to the Quiet Sun at stations on the British Isles, on board four special weather ships cruising the North Atlantic and on board the famous research vessel "Discovery" assigned to the Indian Ocean. The earth's magnetic field was studied by home stations, by stations on Mauritius Island and on board the scientific ship "Vidal"

CONTINUED ON NEXT PAGE

Solar observations from land, sea and space

The British network of stations designated to observe the polar aurorae stretched from North Scotland to Halley Bay in Antarctica, while the stations studying the ionosphere were scattered from Edinburgh and Sheffield to Singapore and the Weddell Sea that washes the Antarctic ice-cap. The English climate did not appear to interfere with radio observation of the sun, which was successfully carried on with the aid of the giant 75-metre radio telescope of the Jodrell Bank Observatory. A regular battery of scientific instruments was set up on the Woomera Range in Australia for launching the British "Skylark" rockets into the upper layers of the atmosphere.

A substantial contribution to the project was made by the scientists of the Federal German Republic. The Max Planck Institute of Aeronomy built an observatory in the Harz Mountains, which was used for the observation of satellites and the study of the behaviour of the ionosphere. The Scherhag Institute in Berlin undertook to prepare daily weather charts for the entire northern hemisphere, and this made it possible to study the effect of solar perturbations on stratosphere temperatures.

An interesting and important programme was implemented by the scientists of the German Democratic Republic. Ozone, in its relationship with the fitful behaviour of the sun, was studied at Potsdam, magnetic variations coinciding with the days of an undisturbed sun were recorded at Niemegk; and studies in the field of wave propagation were carried on at Kuhlungsborn.

A major part of the IQSY programme was implemented by the geophysicists of Czechoslovakia, Japan, France, India, Canada, Poland, Italy and Australia. While space does not permit mentioning their individual contributions, it may be said that the work of each was integrated in this international effort, and each carried an important share.

The information on solar-terrestrial effects collected over the period covered by the IQSY in such widely scattered areas as Yakutia in Soviet Siberia, the Peruvian Andes, Antarctica and the Island of Capri, will serve, in all the 70 participating countries, as a point of departure for scientific theorizing in search of explanations for worldwide physical processes.

While the most important conclusions still remain to be drawn, some have already become apparent. Thus, while the sun was undisturbed polar aurorae were rarely observed outside the Arctic and the Antarctic. There were fewer magnetic and ionospheric storms to cause compass deviations and black out radio communication. A deterioration was observed of the flux of X-rays and ultraviolet rays and the shower of incoming charged particles. Changing conditions in the upper atmosphere brought about a measure of change in weather phenomena. Changes were also observed in the pattern of radiation zones encircling our planet.

Rockets yielded a great amount of information on the upper layers of the atmosphere, which is precisely where the earth's atmospheric envelope receives most of the impact of the various solar emanations. More information is now available on the flux, reflection and distribution of solar heat; on the movement of large air masses; on the behaviour of cloud canopies; and on the effect of solar activity on the density of the upper atmosphere.

The expedition on the "Zarya" discovered extensive magnetic anomalies in the North Atlantic, off the coasts of the British Isles.

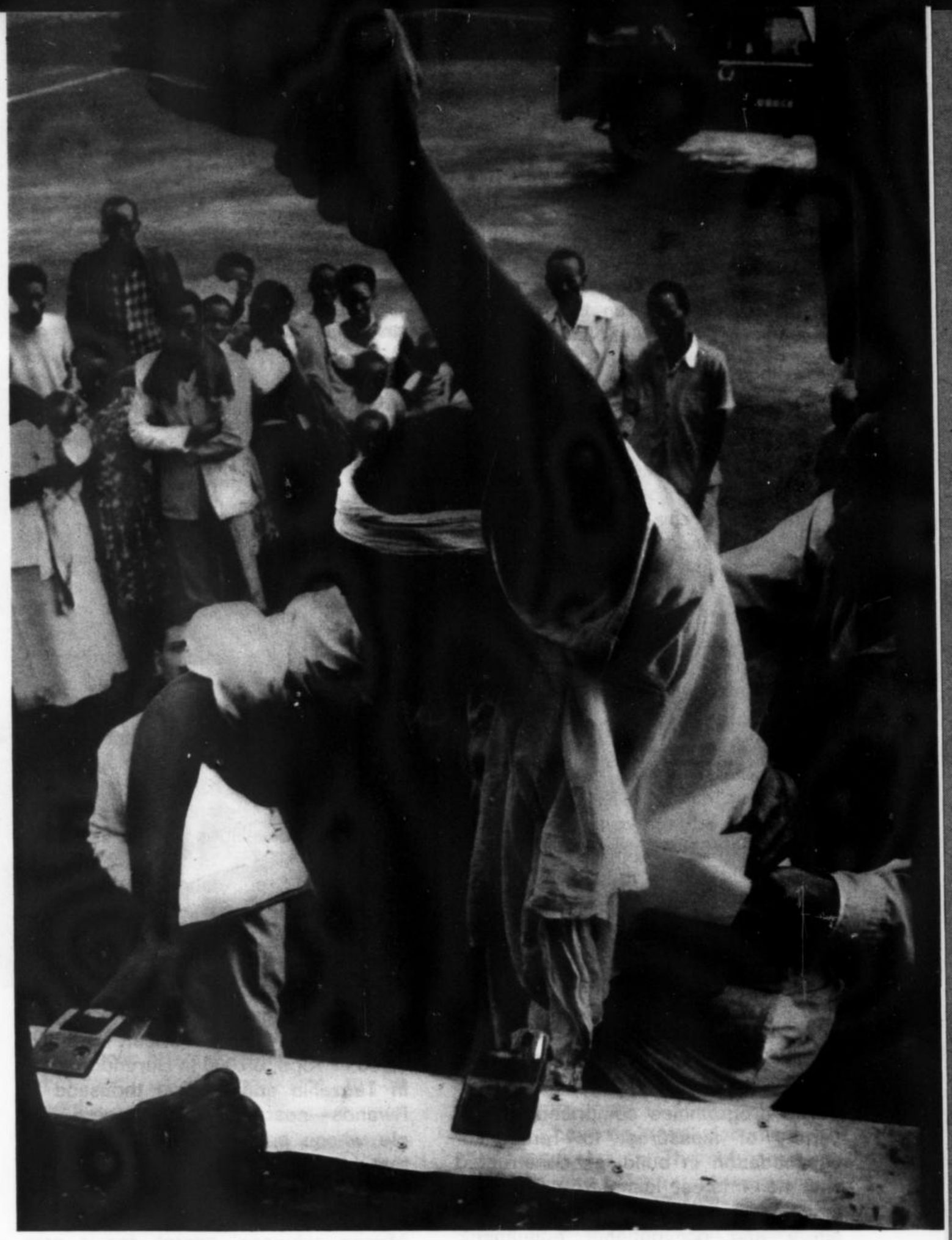
The study of polar aurorae has dispelled some of the mystery surrounding the chemical composition of the upper atmosphere, which was discovered to contain atomic hydrogen and helium of terrestrial origin. It is now clear that the chemical composition of the outer ionosphere is much more complex than hitherto thought, and that even short radio waves can migrate repeatedly from hemisphere to hemisphere following the terrestrial magnetic lines of force. Scientists were able to establish that the intensity of the cosmic rays, and more particularly that of their component low charge particles, roughly doubles during the period of an undisturbed sun, while the flux of positive ions dwindles to half its volume.

It is impossible to enumerate all the scientific achievements under the IQSY programme, all the more so as progress in the field of geophysics is nowadays almost too rapid to follow.

The IQSY project is an excellent example of the kind of joint effort on an international scale that is required by the very nature of the field under study. Perhaps its greatest significance lies in the fact that it has brilliantly demonstrated the fruitfulness of businesslike co-operation among the scientists of all lands.

SOLAR AUTOMOBILE. A plate comprising over 10,000 silicon photo-electric cells on the roof of this venerable automobile has given it the most ultra-modern form of propulsion: sunpower. The silicon cells provide enough power to drive the vehicle at 32 kilometres (20 miles) an hour.

USIS



An airlift organized by the United Nations High Commissioner for Refugees has carried 3,000 Rwandese refugees into Tanzania. Today they have begun a new life in a special settlement area in the highlands of western Tanzania.

UNHCR

United Nations Day 1966

THE WORLD'S REFUGEES

by

Yefim Zarjevski

United Nations Day (October 24) this year will be dedicated to the cause of the world's refugees. In 1965 the United Nations High Commissioner for Refugees was concerned with over 3,000,000 refugees in various parts of the world. Most of them were satisfactorily resettled, or were being re-established in the countries granting them asylum, but substantial numbers still need help.

IN Europe alone 650,000 refugees come within the mandate of the United Nations High Commissioner for Refugees (UNHCR). Some 12,000 of them are still in need of help, and projects for their final resettlement are now being carried out. But in recent years new refugees have been crossing frontiers at the rate of 10,000 a year.

A quick look at statistics from around the world reveals the universal character of refugee problems:

■ The United States has received 470,000 refugees; Canada 35,000; Australia 50,000; and Latin America 125,000;

■ Africa has about 570,000 refugees, over 200,000 of whom were aided by UNHCR in 1965;

■ In India, 45,000 refugees are being helped by the government and by voluntary organizations in other countries;

■ In Nepal, UNHCR, in co-operation with a number of voluntary organizations and with the Swiss government, is trying to find homes for about 7,000 refugees;

■ The authorities in Macao, together with UNHCR and various organizations, are helping about 80,000 refugees, many of them sick or incapacitated.

Statistics, of course, merely make us aware of the magnitude of the problem. The fate of the refugee is but one of the countless ills that weigh on mankind, yet what could be harder to endure than the lot of the refugee, for whom fear and uncertainty are added to material privation. What he needs above all is to feel secure. Experience shows that once he regains his sense of security, even a small amount of help will stimulate his own

CONTINUED ON NEXT PAGE

YEFIM ZARJEVSKI *is a staff member of the information service of the United Nations High Commissioner for Refugees, Geneva.*

Nearly 600,000 Africans uprooted

initiative to make contact with others, and will give him the will to carry on.

Ten years ago, the number of refugees in the world ran into millions—in India, Pakistan, Viet-Nam, Korea and finally, Europe, where displaced persons were waiting for a rare chance to emigrate (see the Unesco Courier, January 1956).

Yet optimism of a kind was beginning to break through. With the help of fellow citizens, the "national refugees", who had settled in countries of which they were originally citizens, were gradually overcoming their initial trials. The others—the million stateless persons scattered throughout Europe—were beginning to benefit from the assistance provided by UNHCR.

When the High Commissioner's post was created in 1951, his field of action was confined to international protection, but by 1956 the scope of the work had been expanded by funds enabling him to implement programmes designed to help integrate people for whom, it had been thought, there was little hope of resettlement.

These programmes were planned to cover a period of ten years; in Europe, they are now nearing completion. They have also made possible the resettlement of over 100,000 refugees in Europe and the Middle East.

The programmes comprised a wide variety of measures: low-rental accommodation in buildings constructed with non-interest loans from UNHCR; money and gifts to help provide furniture and occupational equipment; accommodation in old peoples' homes or hospitals for the aged and sick; study and apprenticeship grants for young people; occupational training for the disabled; rehabilitation, vocational guidance and legal aid.

While encouraging the on-the-spot assimilation of refugees by such measures, UNHCR continued to facilitate migration within Europe and overseas, with the collaboration of the Intergovernmental Committee for European Migration (ICEM), an organization which provides emigrants with information and transportation.

It therefore seemed likely that post-war problems would vanish sooner or later. Unfortunately, circumstances proved such optimism to be unfounded. In some areas, the old wounds were still not healed; Arab refugees from Palestine, for example, were still leading a precarious existence in their camps. The United Nations Relief and Works Agency (UNRWA) for Palestine refugees is still helping them; but for it, they would not have the barest essentials. The joint UNRWA-Unesco educational programme has provided schooling for 200,000 refugee children in these camps. Between 1958 and 1962, UNHCR and the League of Red Cross Societies helped over 200,000 Algerians in Tunisia and Morocco.

At this stage, UNHCR decided to define the part it should play in unprecedented and unforeseen situations—situations in which the United Nations General Assembly was requesting it to intervene and "lend its good offices" to assist refugees who did not necessarily come under its jurisdiction. Such situations had already arisen, in Hong Kong, for example.

Through its "good offices" UNHCR was also able to give prompt relief to the African refugees, whose problems were aggravated when countries previously under colonial administration achieved independence. Social, religious and political disturbances led to large-scale population movements, involving whole communities, in over ten countries in tropical Africa.

There were 270,000 refugees in the Congo, 50,000 in Senegal, about 150,000 in Uganda, 5,000 in Zambia, 21,000 in the Central African Republic, 5,000 in Togo, 65,000 in Burundi, 27,000 in Tanzania and several thousand in Rwanda—nearly 600,000 uprooted people whose presence in the countries that had received them was creating difficult and urgent problems.

The most remarkable episode in the African refugees' search for a new homeland is undoubtedly that of the Batutsi from Rwanda, who fled to the Kivu in 1962, when Rwanda achieved its independence (see the Unesco Courier, January 1963). The Batutsi numbered about 600,000. By 1964, plans for their resettlement were already advanced, thanks to the combined efforts of the League of Red Cross Societies, UNHCR and the International Labour Organization. Disturbances broke out in the region, however, interrupting work and making life there precarious, if not impossible, for many refugees.

Many of them set off again, this time to Burundi, an already overpopulated country. At this juncture, Tanzania generously offered to take some of them, and UNHCR decided to transport a group of 3,000 volunteers there.

It was a long, tortuous journey; the refugees had to cross Lake Kivu by boat, fly over Rwanda, and travel by train and truck to their destination

African refugees drive their herds of long-horned cattle along a road in Uganda. In the first years of this decade there were about 150,000 refugees in this country.

© Dr. Claude Madier, Vichy

over the high plateaux of Mwezi (in Swahili, the plateaux of the moon) — and all this to go 1,000 kilometres (625 miles. Today—a year later—the 3,000 emigrants from Rwanda have cleared, irrigated and ploughed the land and built roads, dwellings, dispensaries and schools. In short, they have brought civilization to this part of Africa.

For the High Commissioner for Refugees it is an absolute rule never, in any circumstances, to intervene in any situation involving refugees unless he is requested so to do by the government of a host country. UNHCR first deals with the most urgent needs, and, on the advice of an expert on the spot, opens limited provisional credits to cover emergency aid.

UNHCR itself, however, has no operational powers; it therefore has to call upon an organization such as the League of Red Cross Societies, which sends its delegates and medical teams to the spot and, in many cases, employs its own methods to obtain assistance in cash and in kind for the work it is undertaking.

There are many other organizations, however, besides this traditional collaborator, which participate, at the request of UNHCR, in its various assistance programmes, and especially in resettlement projects. In implement-

ing these, UNHCR calls upon the United Nations specialized agencies such as ILO, WHO, FAO, or the United Nations Development Programme. Unesco uses its experience to provide aid—progressively increasing—for the education of the refugees and their children. The World Food Programme is also asked to assist, especially in the initial stages of resettlement in rural areas, in providing food for the refugees until their own harvests can meet their needs.

These organizations, moreover, are concerned with promoting the systematic economic and social development of whole regions, and the operations they undertake to assist new arrivals have to be co-ordinated with the rate of progress in the country in which they are settling.

In terms of actual assistance, therefore, UNHCR acts as a co-ordinator and a go-between. Its small budget ($ 3,500,000 in 1965) from the voluntary contributions of 57 governments can barely cover more than a fraction of an assistance programme, but that fraction is often of the greatest importance, since it provides the impetus for an upsurge of international solidarity and co-operation.

But the strength of UNHCR is that, in a given situation, its role is that of a disinterested party acting on behalf of the community of nations, whose sole interest is the humanitarian aspect of the problems to be solved.

This stand debars it from concerning itself with the political reasons for the refugees' plight—but also earns it the confidence of governments.

More and more countries—49 to date—have signed the 1951 Convention on the Status of Refugees. Many others, following the principles laid down by the Convention, have given all their refugees a status guaranteeing that they will not be sent back to a country where their life or liberty would be endangered because of their race, religion or nationality, or because of the social group they belong to or the political opinions they hold.

Although it is for the authorities in the host country to determine the status of the refugee, UNHCR has supervisory rights in this matter, and in most of the countries where it maintains a representative and which have signed the Convention it is able to uphold the cause of the refugee. A special travel document, issued in accordance with the Convention, enables refugees to travel, which they could not otherwise do, for lack of a national passport.

UNHCR has also encouraged the conclusion of other international agreements designed to improve the lot of the refugee. The Agreement relating to Refugee Seamen, for instance, which entered into force in 1961, helps seamen who have no travel documents to obtain legal status. Through close co-operation with other intergovernmental organizations, UNHCR is continuing its efforts to extend the right of seeking asylum to all refugees, to simplify the process of obtaining identity papers, to secure for refugees the right to pursue the liberal professions, to make it easier for refugees to go from one country to another, and so on.

Aiding refugees is essentially a humane task, and one which serves the cause of peace; but it should also be—as it aims to be—constructive. Its object, in the densely populated countries of Europe or in the sparsely populated regions of Africa, is to settle refugees into the community and to help them to become self-supporting and integrated as speedily as possible.

United Nations Day, October 24, 1966, will mark the launching of a fund-raising campaign in many European countries to aid refugees, mainly in Africa and Asia. Proceeds will help to finance re-settlement projects and also rural settlement centres, dispensaries and schools—projects with which a great many private voluntary organizations as well as the U.N. specialized agencies are associated.

UNGATHERED HARVESTS IN THE OCEAN

(Continued from page 15)

feed and put it into concentrates for direct human consumption, and find the right set of economic keys for this, we would have a strong weapon against malnutrition.

In any such scheme to reduce our food problems, we must increasingly rely on international co-operation to the point where internationalism has become the most important single factor in world fishing.

Meanwhile, man's ability to catch more fish is leading to international complications. Ironically, as the catch goes up and traditional grounds such as the North Sea and the Grand Banks are fished ever more intensively, more effort in men and gear must be put forth to harvest the same amount of fish. Nations have begun to try to protect their own coastal fisheries by keeping foreign fishermen outside a certain fishing limit.

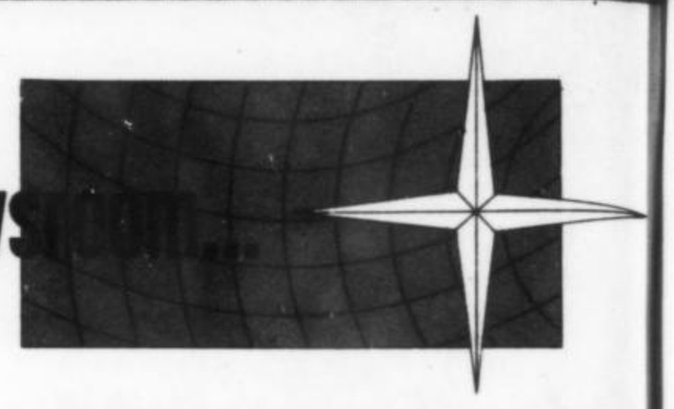
Since 1959, this has caused an increasing number of international incidents. A healthy side effect has been that, as traditional grounds become depleted or restricted, the search for newer grounds has been spurred and many new sources of sea food have been discovered; for example, the Arabian Sea and the rich shrimp grounds of the Persian Gulf.

As the search continues, a new concept of ocean ownership is being forced upon us. This negates the old idea that no one owned the ocean beyond territorial limits. It implies that **all** nations own the sea and must accept attendant responsibilities.

A recent example of where this has gone wrong is seen in the overhunting of Antarctic whales to the point of commercial extinction of the larger species and consequent loss of a potentially great world food source. In the eastern Pacific, the only areas where sufficient research has been done on tuna stocks, yellowfin tuna were found to be declining. Fortunately, the Inter-American Tropical Tuna Commission has been able to work out regulations for maximum national catches in the area. No similar research has been done in the Atlantic, but there has been a recent decline in the catch per longline hook, which may be an advance warning of depletion. FAO hopes soon to set up a strong commission for research, conservation and management of Atlantic tuna.

In recent years almost every part of the ocean has come under the surveillance of some kind of fisheries commission, by region, species, or both. We must ensure responsible international co-operation if we are to keep the sea resources we have and increase them.

From the Unesco News...



Sunpower for spacecraft

A propulsion system for use in space which derives power from the sun alone is beginning to show promise. The idea is to combine large, lightweight arrays of solar cells with an electric propulsion system, to generate a small but continuous thrust. Studies in the U.S.A. have demonstrated that solar cell arrays having a much higher power-to-weight ratio than those so far employed in spacecraft are indeed possible. One concept is for a flexible array of solar cells that would be unwound from a drum in space. Another arrangement uses a "skin" of silicon cells a mere 0.004 inch thick. Arrays of this sort would feed their power to such "microthrusters" as the ion and plasma rockets now under development in several laboratories.

Fighting river blindness

Israelis and Liberians are co-operating to provide Liberia with a comprehensive eye-service. Among the diseases they are fighting is river blindness, a disease which causes great suffering in Liberia where its incidence is among the highest in the world. River blindness is transmitted to human beings by the bite of a black fly, which injects microscopic live worm parasites under the skin, from where they migrate through the bloodstream to the eye, thereby causing blindness. Teams of Israeli opthalmologists have been sent in rotation to Liberia to set up and run an eye hospital in Monrovia, while Liberians have been trained in Jerusalem to take over the service in their own country within six years.

Forests and the future

By 1975 the world will need nearly 50 per cent more wood and wood products than it did in 1961, according to a recent FAO study which says that most of this additional wood will come from the world's temperate forests, particularly those of North America. The study, the first such global analysis carried out on a country-by-country basis, also looks beyond 1975 and points out that even the huge reserves of Canada and the Soviet Union are not limitless. It suggests that other regions might come into prominence as timber-suppliers through man-made forests capable of yields five to ten times higher than those of temperate forests.

More technicians for Ceylon

A six-year programme to train engineers and technicians in Ceylon to help the nation's industrial growth is to be administered by Unesco on behalf of the United Nations Development Programme. Costing some $4.7 million, the project will be set up at the Ceylon College of Technology, where Unesco will help to establish three-year technician courses and five-year diploma engineering courses in civil, mechanical and electrical engineering. Ceylon will contribute the equivalent of $3 million, chiefly for the expansion of classrooms and laboratories and the provision of teaching and administrative staffs.

Fresh water from the sea

Aerial inspections have been made by a joint study group of the International Atomic Energy Agency, Mexico and the United States to investigate potential sites for a nuclear water desalting plant in the Gulf of California area. The group was set up last year to examine the technical and economic practicability of a dual-purpose nuclear power plant designed to produce fresh water from the sea and electricity for the arid regions of Arizona and California (U.S.A.) and Sonora and Lower California (Mexico).

Car for Asian farmers

U.N. specialists are helping Asian farmers with the design and production of a farmer's car that would eventually replace the traditional bullock cart. The proposed vehicle should cost under $500, do about 50 miles per gallon, have a high road clearance and should be suitable for travelling across fields. It is hoped to display a vehicle of this kind at the First International Asian Trade Fair, in Bangkok, in November.

Computer-based weather service

The Swedish Weather Bureau's activities will be completely automated within five years if a plan proposed by the Swedish Meteorological and Hydrological Institute is put into effect. Three computers would handle telecommunications and the drawing of observation, analysis and forecast maps. The country's 1,000 regional weather offices would be replaced by fewer stations with more advanced equipment. The Swedish Institute has based its project on the World Weather Watch plan which calls for a unified world system for the exchange of weather information.

Training Africa's literacy leaders

A Workshop for African Planners and Organizers of Adult Literacy Programmes recently brought some 30 educators from 20 African countries to Tashkent, for a seminar organized by Unesco and the U.S.S.R. which enabled teachers, adult education officials and school supervisors to study literacy teaching methods that have been used by the Soviet Union. At about the same time, courses on the planning and administration of literacy programmes for French-speaking Unesco member states in Africa were being given at the Institute of

Planning and Economic Development in Dakar, Senegal. Studies in Dakar included the problem of financing literacy campaigns, the role of teachers and the kinds of aid available; special attention was given to the role of women in education.

Saving the one-horned rhino

Depredations by poachers have reduced the population of the Asian one-horned rhinoceros, whose home is in the Kaziranga Wild Life Sanctuary, Assam, to under 400. The animal is hunted for its single horn, whose alleged but entirely mythical aphrodisiac and medicinal properties give it a black market value of as much as $1,000 a pound. In an effort to save the remaining animals, a group of experts, including specialists from the International Union for the Conservation of Nature and Natural Resources, has proposed that the Kaziranga Sanctuary be converted into a national park.

World federation of engineers is proposed

A move to establish the first world federation of engineers has been made by an international meeting of representatives of engineering organizations held in Unesco House. The proposed organization—to be called the International Conference of Engineering Societies—would be composed of national and regional groups. The constitution proposed by the Paris meeting declares that "a strong and dynamic engineering profession is essential to the successful development of any nation."

Pocket reading machine for the blind

A new reading machine no bigger than a pocket flashlamp which can read anything from Shakespeare to the label on a can of food is being developed for the blind. The Visotactor, as it is called by its two U.S. inventors, is still in the experimental stage, but its essential features have been developed. It consists of photocells and finger vibrators. By slipping fingers into four slots and moving the Visotactor across a printed or written page the blind receive vibrations that signify letters, 26 transistors in the handle of the machine translating pictures from the photocells into electro-mechanical vibration. It is expected that commercial production will begin within two or three years.

The man with the axe

The forest worker and his working conditions illustrate one of the main differences between the developed and the developing countries. Where labour is cheap and abundant, man's muscle almost exclusively is used to chop down trees. Where labour is scarce and expensive, elaborate machines have been introduced to do the work. Primitive working methods can mean as much as 50 times more expenditure of effort than when the same job is handled efficiently. Nutritional differences can account for as much as 70 percent increase in work capacity, according to a study comparing the output of Indian and Swedish forest workers. Problems of the care and more efficient use of the forest worker—long the concern of such international organizations as FAO, ILO and WHO—were studied recently during a session on "the human factor in forestry" at the Sixth World Forestry Congress in Madrid.

Untapped inland fish resources

The vast network of lakes and reservoirs formed by dams in the central United States could supply additional millions of pounds of fish a year if proper boats were designed and built for fishing them, according to two U.S. fisheries experts. In a paper presented to an FAO meeting on fishing boats held in Sweden, they say that though the dams were built for flood control, irrigation or hydro-electric purposes, there is no reason why their waters should not support thriving commercial fisheries. Among examples they quote is the Kentucky Lake in Tennessee which covers 158,000 acres and has a potential yield of 32 million pounds of fish annually.

Museums of India

"Although India is often grouped with the developing nations in some aspects of its activity as a nation having assumed independence only eighteen years ago, it is among the countries which can show a long museum history," writes Grace Morley, honorary adviser on museums to the Government of India (1). Of India's 200 museums, five are more than a century old and the oldest, the Indian Museum in Calcutta, goes back to the late eighteenth century. A review of India's museums presents a picture of diversity and utility. The Archaeological Survey of India maintains a dozen site museums in addition to looking after 3,000 historical monuments. Municipal, university and private museums devoted to archaeology, traditional cultures or natural history play a major role in education and culture. Three museums of industry and technology —at Calcutta, Bangalore and Pilani—are an invaluable help in supplementing teaching in science and technology.

(1) In the Unesco quarterly, "Museum " (Vol XVIII, No. 4, 1965; 10/-, $2.00).

Flashes...

■ *Paris is the world's most overcrowded city with 32,000 people per square kilometre as against 16,000 in Tokyo and 13,200 in New York, reports WHO.*

■ *Primary school attendance in Peru rose from just over one million to nearly two million between 1960 and 1965.*

■ *Some 167 million motor vehicles are now in use throughout the world. Of these, nearly 90 million are in the U.S.A. and 51 million are in Europe.*

■ *There are probably 10 to 20 million active tuberculosis cases in the world and the disease kills between one and two million persons every year, reports WHO.*

■ *Fully 70 percent of the world's one and a half million fishing boats are still powered by sail or paddle, says FAO, which sees the equipping of these craft with outboard motors as a rapid, practical way to raise fish catches in the developing nations.*

BOOKSHELF

■ **Yearbook of the United Nations 1964.**
The latest—18th—edition of the Yearbook, chronicles, within a fully indexed volume, the activities of the United Nations and its related agencies during 1964. United Nations, New York, 1966 ($16.50 or equivalent in other currencies).

■ **Scientific Problems of the Humid Tropical Zone Deltas and their Implications.**
Proceedings (papers and a summary of discussions) of the Dacca Symposium, jointly organized by the Government of Pakistan and Unesco in 1964. Unesco, Paris, 1966, 60/-; $12 (paper cover); 70/-; $14 (hardback).

UNESCO'S TRANSLATIONS SERIES

From Japan

■ **Yoshitsune.**
Thousands of Noh plays, Kabuki plays, novels, stories, poems and films have been devoted to Yoshitsune, the most romantic of Japanese heroes. This is the first translation into English of the original fifteenth-century biography on which these works were based. Translated and with an introduction by Helen Craig McCullough. Stanford University Press, Stanford, California, 1966 ($6.50).

■ **The Autobiography of Fukuzawa Yukichi.**
Fukuzawa, founder of Keio University, was the man who was most instrumental in bringing Western culture to nineteenth-century Japan. Here he tells of his childhood, his schooldays, his adult personal and private life with great frankness. Translated by Eiichi Kiyooka. Introduction by Carmen Blacker. Columbia University Press, New York and London, 1966 (56/-; $6.95).

■ **Major Plays of Chikamatsu.**
Chikamatsu Monzaemon (1653-1725) was the greatest Japanese playwright. Eleven of his 130 plays—ten domestic tragedies and one historical drama—have been here translated by Donald Keene, with an informative introduction. Columbia University Press, 1961 ($8.50 ; 68/-). A paperback edition giving only four of the plays is also available under the title "Four Major Plays of Chikamatsu" ($1.95; 16/-).

All the above titles can be ordered from your local bookseller or from the publishers. In the U.S., the Unesco Publications Center, 317 East 34 St., New York, can supply all volumes.

★

■ **Music for the Handicapped Child.**
By Juliette Alvin. A deeply human study of the great unused potentials of music—the most social of all arts —as a remedial treatment that may help the mental, perceptive or emotional growth of the handicapped child. Oxford University Press, London, New York, Toronto, 1965 (21/-; $3.40).

Letters to the Editor

THE REFLECTING TELESCOPE

Sir,

In "Great Men, Great Events" (March 1966), you state that Newton's studies on light led him to invent the reflecting telescope. This is an erroneous idea. In 1616, Nicholas Zucchi, a Jesuit priest, from Parma, had already built a reflecting telescope equipped with a concave metallic mirror. Because of the short distance between the mirror and the eyepiece, he was obliged to place the mirror obliquely; this produced an astigmatism and, as a result, a distorted image.

In 1634, another priest, Father Marin Mersenne, of Paris, suggested a way to avoid tilting the concave mirror: by piercing it and then using a small secondary mirror to direct the rays of light through this opening.

Independently, a Scottish mathematician, James Gregory, had a similar idea in 1660, but with the difference that the secondary mirror collected the rays of light and directed them to an eyepiece placed behind the main mirror. In Mersenne's telescope the smaller mirror had also served as an eyepiece. Gregory's reflecting telescope was actually constructed, but proved unsatisfactory because of optical aberrations. In 1674, the year before Gregory's death, the English astronomer Robert Hooke produced the first satisfactory Gregorian telescope.

In the meantime, Isaac Newton had also been studying the problem of the reflecting telescope. He conceived the idea of placing the collecting mirror at an angle of 45 degrees to the primary mirror, thereby inflecting the converging rays of light at right angles towards the eyepiece. In December 1671, Newton presented his telescope to the Royal Society, of which he was shortly afterwards made a member. The same year, a Frenchman, François Cassegrain, also demonstrated a telescope which he had based on Gregory's instrument. Cassegrain telescopes are still widely used today.

Prof. H. Sauer
Carona, Switzerland

WANDERING SHOALS

Sir,

In Daniel Behrman's interesting article, "A New Mediterranean Fishing Problem" (March 1966), the writer discusses the fact that the first large-scale appearance of Red Sea species occurred in the Mediterranean between 1940 and 1945, and asks why the change occurred so long after the opening of the Suez Canal.

May I, as a long-time inhabitant of these shores—though not an ichthyologist—offer a suggestion.

For several years during World War II, the Suez Canal was blocked to all through-going shipping. If, as your article states, the current in the Suez Canal flows from the Red Sea to the Mediterranean during eight months of the year, plankton and fish could flow with it, totally undisturbed by steamers and the accompanying discharge of oil and other unhealthy substances, during these years—as far as I know the only period during which the Canal was not used for inter-sea traffic.

If the stoppage of traffic during the war years brought with it a wandering of shoals, the phenomenon should have been observed by people living along the canal. Systematic enquiry among these people may help the scientists interested in solving the problem.

Dr. Eva Danelius
Nof Yam-Herzliya B, Israel

ANCIENT AFRICAN SCRIPTS

Sir,

I have read with interest your article, "Ancient Scripts from the Heart of Africa" (March 1966). It was most interesting and informative, but I would like to point out two minor errors. On page 26 you state "Momolu Massakwa, the Liberian consul in Britain, has told how the Vai transmitted news...by means of pictograms on strips of bark." The correct spelling of the name is Momolu *Massaquoi* and he was Liberian consul in Hamburg, Germany, rather than Britain.

Raymond J. Smyke
World Confederation of Organizations of the Teaching Profession
Washington, D.C., U.S.A.

THE STEP TO MAN

Sir,

In "The Step to Man" (Dec. 1965), John R. Platt wonders whether the dramatic changes of modern life will converge to various kinds of limits and doubts whether science can keep on expanding indefinitely. He also tries to foresee how man will live in the future.

I think it would be wrong to envisage life in the future on the basis of science alone. Science is very important today, but neither it, nor philosphy, nor art can influence all people. But to develop a new society, a new world needs the efforts of all people. By what can we influence everyone? I think, by affection, and the first place where affection is needed is in school.

To my mind our present day education is too little concerned with giving young people the right outlook. In general they acquire only knowledge, and the number of those who leave school with an awareness of other people's problems and an urge to be helpful is very small. I'm sure there would be far fewer "Teddy boys" and "Halbstarkes" if the educational spirit were perceptive and in harmony with the modern world.

Csaba Erdelyi
Budapest, Hungary

MESSAGES TO THE STARS

Sir,

In his intensely interesting article, "Messages to the Stars" (Jan. 1966), D.M.A. Mercer discusses the possibility of sending the digits of *pi* (the ratio of the circumference of a circle to its diameter, 3.141592) as an introductory message to alien intelligent beings.

In its traditional form, *pi* is written, of course, on the decimal base—a number base that is unlikely to be used by anyone other than humans with ten fingers.

If the digit *pi* is used I feel it should be transcribed into the simplest number base and the one most likely to be used by those who may pick up the message. The most suitable base would be the binary system, in which case *pi* would become 11.0010010000 111111011010111...

It would be even better to send the digit *pi* written according to different number bases. This would enable intelligent beings not only to show us, by the choice they make of our repeated signals, what they have understood, but also to reveal their own system of numeration.

Paul Bresson
Versailles, France

YOUTH WITH A PURPOSE

Sir,

I enclose an article from one of our Canadian newspapers, describing archaeological work done by students, which I thought stressed a point brought out in your July-August 1965 issue on Youth: young people doing constructive work during their holidays, learning as well as enjoying themselves and keeping out of trouble, unlike other young people of this age who seem to take pleasure all over the world in rioting, looting, vandalism and terrorizing whole communities with their wild sprees of jazz and destruction. Why can't the constructive young people get the same publicity and admiration from their own age group instead of from fuddy duddies of 50 like me? It is inexplicable!

I enjoy your magazine which I find both interesting and informative.

Claire Hoult
Montreal, Canada

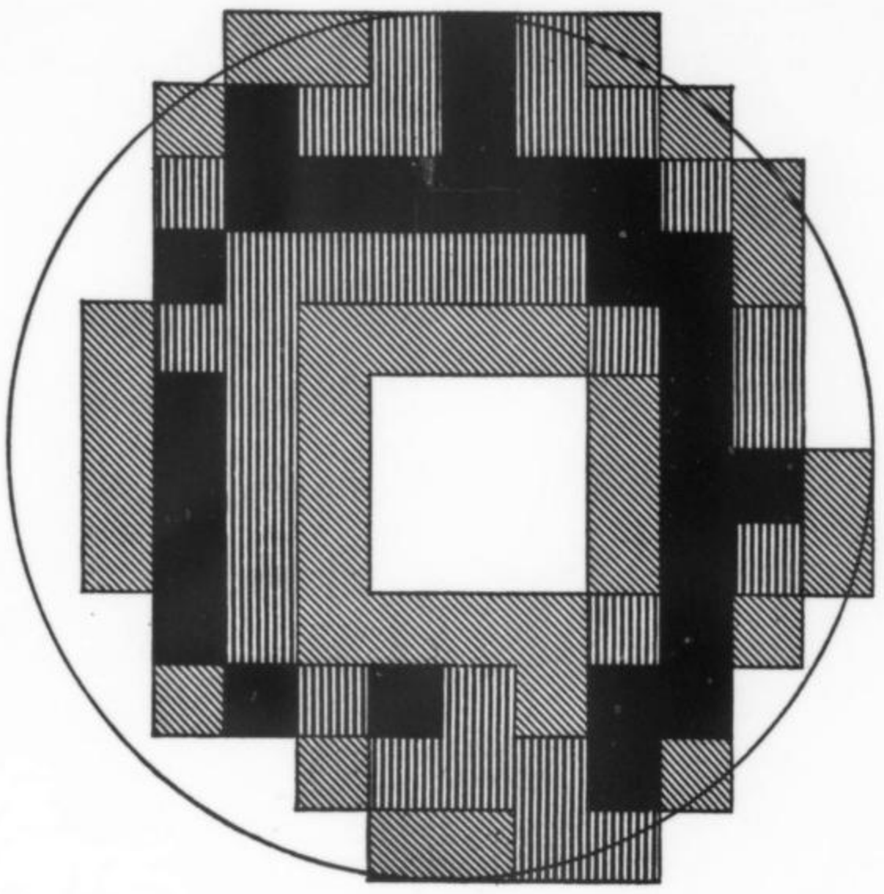
GOOD WORDS FOR GOOD WORK

Sir,

I am one American who believes very much in the U.N. I am aware of the criticism launched against the good work of the U.N. and its agencies . . . and it makes me feel quite sad that, particularly, some professed Christians are so critical of the way our united efforts with other countries are bringing health and education to people in some of the underdeveloped areas of the world.

Lucy McFarland
Issaquan, Washington, U.S.A.

Imp. GEORGES LANG, PARIS. IMPRIMÉ EN FRANCE.



THE PSYCHOLOGY OF THE USE OF AUDIO-VISUAL AIDS IN PRIMARY EDUCATION

Growing use of audio-visual aids raises new problems and possibilities. These are explored in a searching international analysis of the psychological impact on the teacher as well as the pupil. The judgment of a panel of experts from ten countries was edited by Professor Gaston Mialaret of the Educational Psychology Laboratory of the University of Caen, France. He considers those audio-visual techniques which the educator may have constantly at his disposal in a classroom and those devised or built by the teacher for his own purposes as an educator. For the purposes of simplification, the study is restricted to pupils between the ages of seven and 12.

The book takes up initially the basic phenomena of perception, examining specific situations as well as the general psychological problems of teacher and student. This is followed by a chapter on other psychological aspects, including empathy phenomena, comprehension and the creation of motivation. Another chapter summarizes the principal conclusions of the panel. Finally, an extensive bibliography is printed.

This book is intended primarily for teachers of both psychology and education in teacher-training centers, but it is also of value to research workers. It belongs in the libraries of pedagogical institutions, in educational documentation centers and in the hands of all who are involved in audio-visual services.

1966, 225 pages, $6.00

UNESCO BOOKS ON RELATED SUBJECTS

THE EFFECTS OF TELEVISION ON CHILDREN AND ADOLESCENTS: An annotated bibliography with an introductory overview of research results.
1964, 54 pages, $0.75*

THE INFLUENCE OF THE CINEMA ON CHILDREN AND ADOLESCENTS: An annotated international bibliography.
1961, 106 pages, $1.50*

SOCIAL EDUCATION THROUGH TELEVISION: An All India Radio-Unesco pilot project.
1963, 44 pages, $0.50*

THE TEACHING FILM IN PRIMARY EDUCATION
1963, 51 pages, $1.00*

TELEVISION TEACHING TODAY
by Henry H. Cassirer

A general survey of the use of television for education in the U.S.A., U.S.S.R., Canada, France, Italy, Japan and the United Kingdom. Contains a detailed analysis of the problems presented by television to both teachers and students. Offers suggestions for ways in which television may constructively support the traditional values of teaching. Illustrated.

1960, 267 pages. $4.00

* *Please prepay orders for these titles.*

Order from

UNESCO PUBLICATIONS CENTER ★ 323 EAST THIRTY-FOURTH STREET ★ NEW YORK, N.Y. 10016

© APN

YEARS OF THE QUIET SUN. Children at play depict their own familiar, everyday world bathed in the rays of the sun. For long the sun was worshipped as the giver of food, heat and light, but man knew little of his nearest star, which commands the movements of the earth and planets. Today he has learned that it experiences periods of intense activity and others of relative calm. During "The Years of the Quiet Sun" in 1964-1965, scientists from over 70 countries carried out a vast solar research project whose results are now being studied (see page 22).